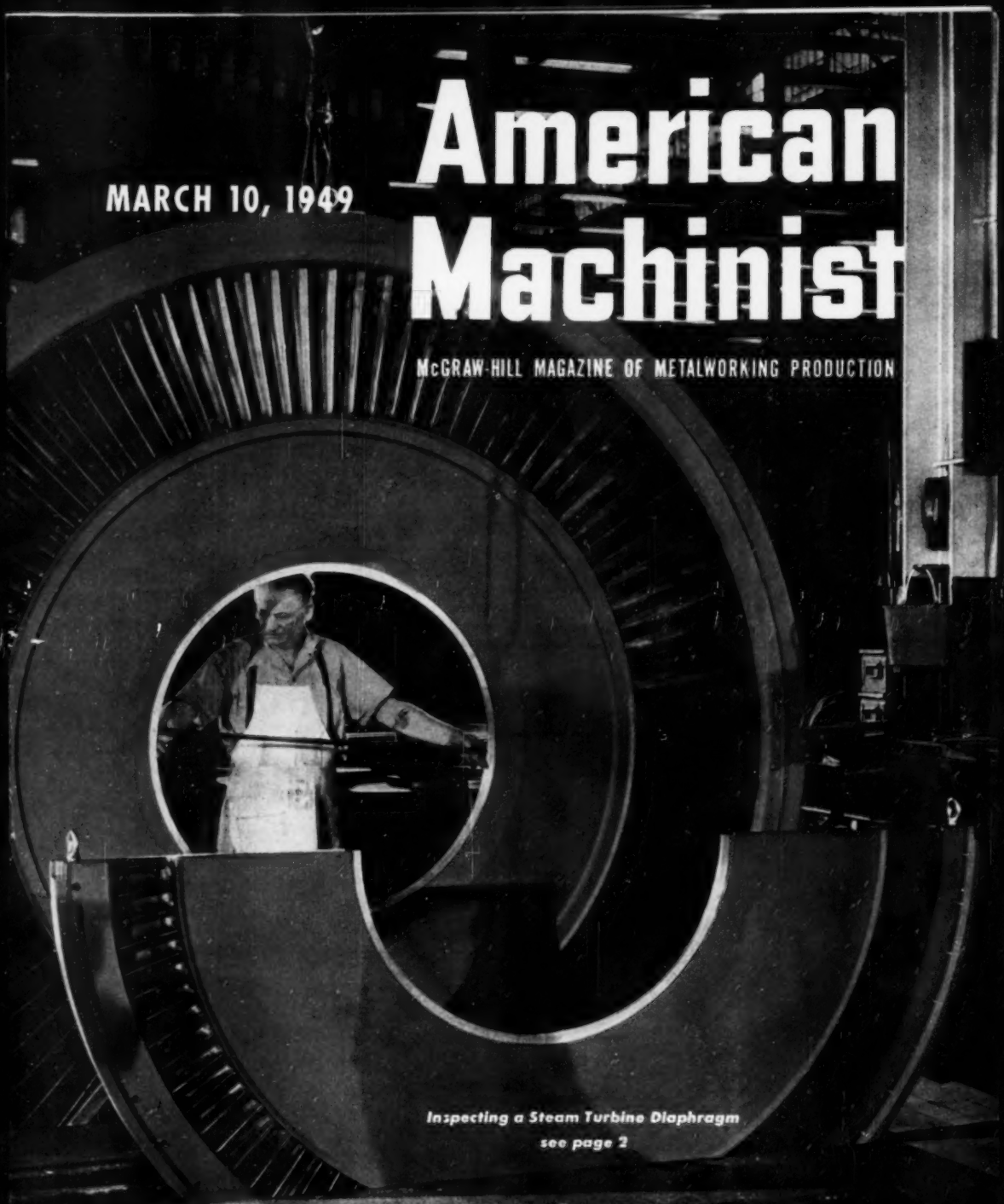
MARCH 10, 1949

American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION



Inspecting a Steam Turbine Diaphragm

see page 2

Rubber Forming of Light Metals — SPECIAL REPORT

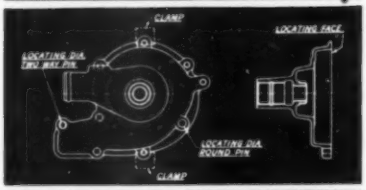
Hard Chrome Plating Has Its Uses

Shop Problems with 75 S-T

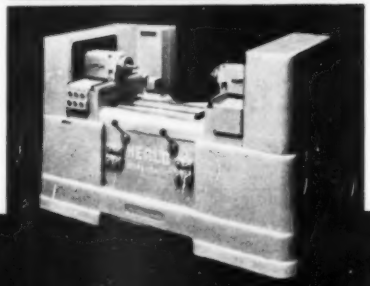
Still another automotive manufacturer

FINDS NEW WAYS TO CUT COSTS

by BORIZING



THIS PART, an automobile water-pump body, is bored, faced, grooved and chamfered all in one operation...



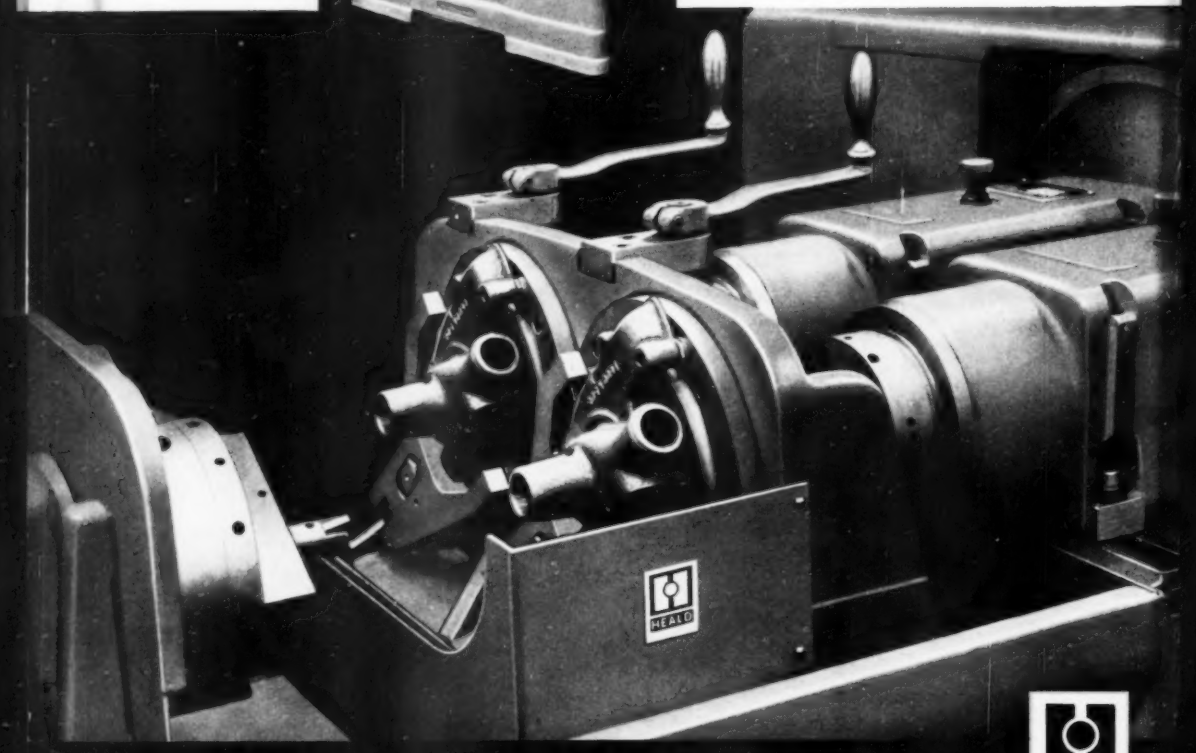
ON THIS MACHINE, a Heald Model 322 double-end Bore-Matic. Multiple tooling and clamping fixture shown below.

A single Heald Bore-Matic now does the work of <u>two</u> other machines, for finishing water pump bodies

Here's an example of how Borizing created a two-way saving for this automotive manufacturer — both on production cost and on capital investment.

Water pump bodies that used to require separate operations on two different machines are now finished two at a time, on a single Heald Model 322 Bore-Matic. With one set-up, and in one high-speed, automatic cycle, they are bored, faced, chamfered and grooved much faster than before, and with better finish and higher accuracy.

Why not ask your nearest Heald representative to show you how Borizing can improve your production picture? We'll be glad to help you.



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American Machinist

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Chips and QUIPS

Our Cover . . . A "still" Kodachrome made by Jim Burns during the filming of the G. E. Turbine Division Technicolor movie, "Power by Which We Live," our cover picture is a pleasing study of an inspection operation. The parts are steam-turbine diaphragms. Note the color scheme of the plant, evident at right.

Gear Grinding . . . Darr Dudley of G. E., as part of a symposium on gear-grinding at the Semi-Annual Meeting of the American Gear Manufacturers, discussed his company's methods on medium-pitch aircraft gears. We asked him to amplify the material to include shop details, present it in this issue.

Revamping . . . American Sterilizer Co. (Erie, Pa.) executives suddenly discovered aisles were cluttered with material so traffic was hampered, and the dispatching office was at one end. The office was moved to about the center of the working area, machines were rearranged for better materials handling —and, while they were about it, they cleaned up the plant and modernized the lighting. The change, step-by-step, and its results are described herewith.

Rubber-Pad Forming . . . For many years, shop men made model stampings in light-gage metal, and small lots of parts, by using a male die and a confined rubber pad. Then, during World War II, the process was "rediscovered" and extensively applied in forming aircraft sheet metal. Since the war, there have been other applications. R. Burt Schulze, supervisor of mfg. research, Glenn L. Martin Co., has written a book on fabrication of light metals, soon to be published. His chapter on rubber-pad forming was the best compilation of available data on the subject we've seen. We've made a prepublication extract for you as our Special Report.

Annual Review . . . We remember the old Negro preacher's explanation of his success with sermons: "First Ah tells 'em what Ah'm gonna tell 'em, den Ah tells 'em, den Ah tells 'em what Ah done tole 'em." But sometimes we don't remember it often enough — which leads to occasional misunderstandings. Several manufacturers were confused by our Annual Review, although it's our 36th, asking why their products are not included. We include there every description previously published in our regular "Shop Equipment News" and "Parts & Materials" pages during the preceding year—*but only those*. While these are the most comprehensive departments anywhere on metalworking equipment, there are always some makers who fail to let us know of new products, and whom we fail to visit just as they're bringing out a new product. . . . Those are the ones we—and you—miss . . .

75ST . . . The heat-treatable aluminum alloy, 75ST, came into prominence at war's end, has been used extensively since. It's individualistic and tricky in distortion and warping as a result of heat-treatment. C. W. Alesch, chief metallurgist of Consolidated-Vultee Aircraft Corp., has put together for you the available information.

Coming . . . March 24 *A.M.* will include a Special Report on Electroplating by Associated Editor Jim Linsley—a comprehensible condensation of the vast amount of data available. We begin in this issue also a 2-part article on heat-treating control, with special attention to electronic devices, by David Fidelman . . . Also, we've tried to put in words the story of O. S. Walker and his early experiences with magnetism . . . Then we tell how to produce equipment for investment casting for $1000 or less, written by a competent caster . . . Continuous gaging is becoming more and more useful in Metalworking, so A. C. Sanford of Federal Products outlines its applications . . . There are also articles on crush-ground profiles for finishing telephone plugs (cost reduction 50%) and on marking plug and ring gages with ordinary pen and ink, as done at Kollsman Instrument.

ELECTROPLATER . . . Art Loquorzo is the traditional self-made man. He had only a grammar-school education, started to work at 14, began plating 20 years ago and has stuck with it ever since, but always specializing in hard chrome. He has been plater, supervisor, service engineer and technical director before he founded the Nutmeg Chrome Corporation of Hartford, Conn., late in 1944.

Among companies for whom he has worked are Conn. Tel & Elec. Co., International Silver, Remington Rand, Pratt & Whitney, G. E., Hartford Chrome and MacDermit. At G. E. he received the Coffin Award for development of mold plating. He is now first V. P. of the American Electroplaters Society, has lectured all over eastern U. S. and Canada, presented many papers and written many articles. He has four children, still finds time to play 4-wall handball for exercise. In this issue is his own appraisal of hard-chrome plating.

DISTORTION-FREE GEARS
for Longer Life

GLEASON NO. 1 SURFACE HARDENER

SPECIFICATIONS*

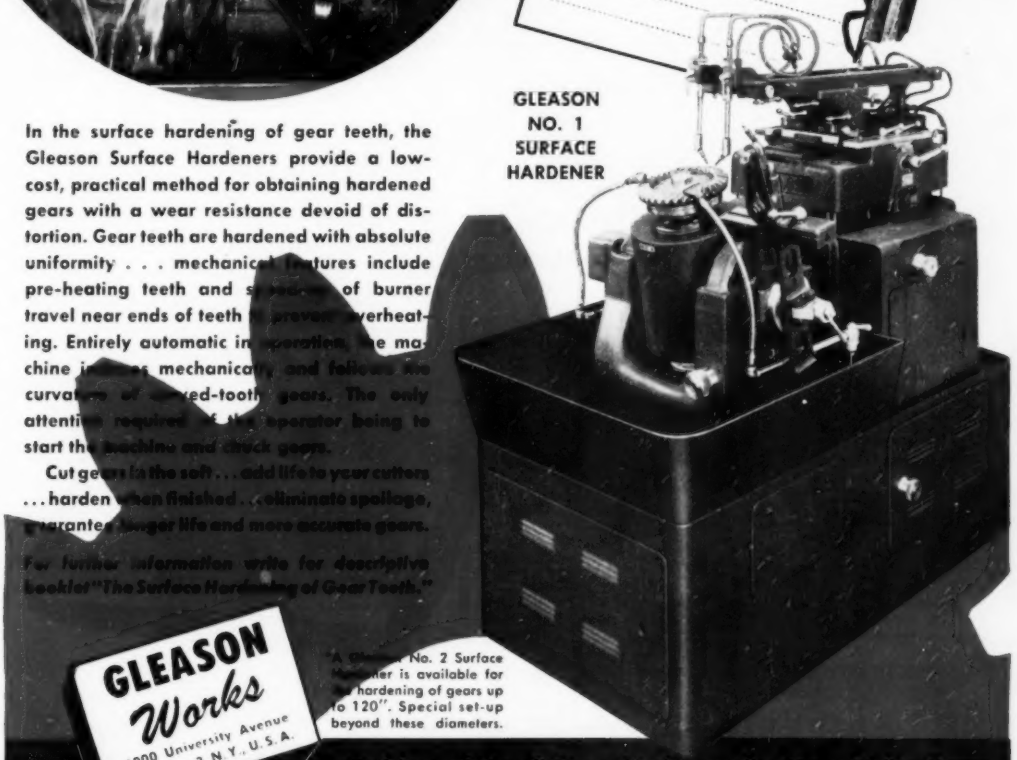
CAPACITY:

Maximum Pitch Diameter	
Bevel Gears	24"
Spur and Helical Gears	34"
Internal Gears (max. outside dia.)	24"
Largest Pitch	1½ D.P.
Smallest Pitch	24 D.P.
Longest Face	5½"
Range in Number of Teeth, 5 to 200	

In the surface hardening of gear teeth, the Gleason Surface Hardeners provide a low-cost, practical method for obtaining hardened gears with a wear resistance devoid of distortion. Gear teeth are hardened with absolute uniformity . . . mechanical features include pre-heating teeth and s[illegible] of burner travel near ends of teeth to prevent overheating. Entirely automatic in operation, the machine indexes mechanically and follows the curvature of curved-tooth gears. The only attention required of the operator being to start the machine and check gears.

Cut gears in the soft . . . add life to your cutters . . . harden when finished . . . eliminate spoilage, guarantee longer life and more accurate gears.

For further information write for descriptive booklet "The Surface Hardening of Gear Teeth."



GLEASON NO. 1 SURFACE HARDENER

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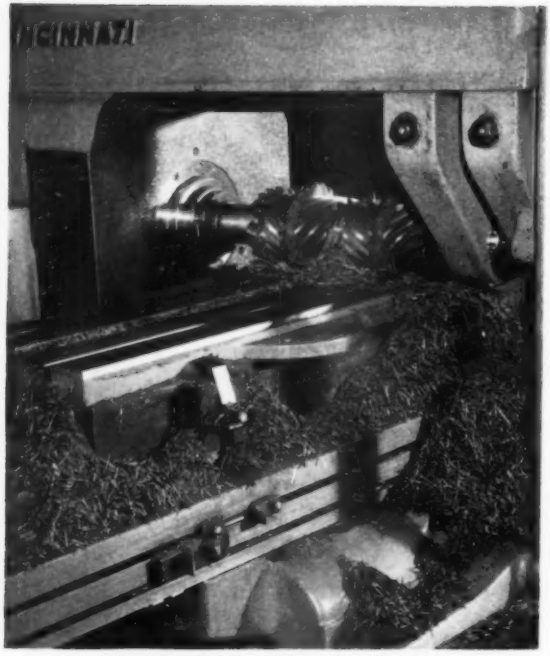
*A Gleason No. 2 Surface Hardener is available for the hardening of gears up to 120". Special set-up beyond these diameters.

Builders of Bevel Gear Machinery for Over Eighty Years

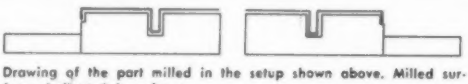
DUAL POWER DIAL TYPE

Mills two tables at one time

With power to spare!

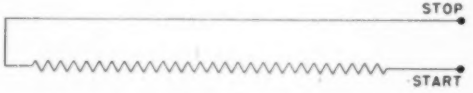


When a new machine tool can nearly double the output of an older one, it's certainly worth looking into. One of the ways in which it can be done is illustrated here. Two cutter grinder tables are milled in one pass on a CINCINNATI No. 5 Dual Power Dial Type, removing about 3/16" stock and milling the slot from the solid. These machines are big and powerful (50 hp and 50" table traverse), they take wide heavy cuts at a fast feed rate; Dynapoise Rectangular Overarms give them an extra measure of smooth cutting ability. ¶Other High Power and Dual Power Dial Type features: Variety of automatic table feed cycles • Single lever table control engages table feed and rapid traverse, both directions • Twenty-four spindle speeds, 100 to 1 ratio • Thirty-two feeds ¼" to 60" per minute in geometrical progression • Speeds and feeds changed by power, with a single four-position lever which enables the operator to rotate the dials in either direction • Finger tip starting and stopping of spindle drive with a small lever, front and rear.



Drawing of the part milled in the setup shown above. Milled surfaces indicated in color.

Part name .....Table	*Depth of cut*...Slot—from solid
Material .....Cast iron	Other surfaces—3/16"
Operation.....Rough mill top, locating edge, and slot	*Cutting speed*.....90 feet per min., max.
Feed.....7½" per min.	*Production* .....11 per hour



Automatic table cycle for the setup illustrated. Power rapid traverse of 150 inches per minute takes the work to the cutter quickly—and returns the table rapidly to work loading position.

Additional features, of interest to both shopmen and management, are outlined in two attractive catalogs, M-1644 for the Nos. 3, 4, 5 and 6 High Power Dial Types, and M-1647 for the Dual Power Dial Types. Write for them.

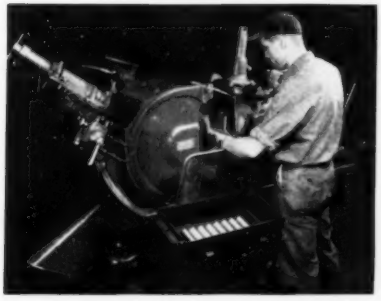
THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

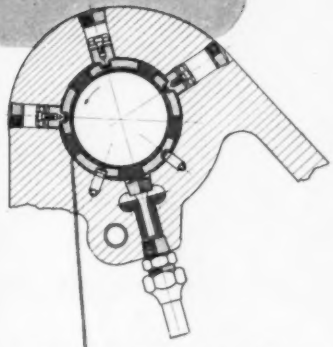
MILLING MACHINES • BROACHING MACHINES • CUTTER SHARPENING MACHINES
FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

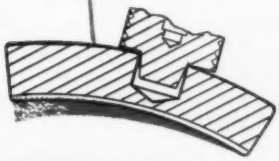
NOT A CENT FOR MAINTENANCE required by more than 99% of FILMATIC SPINDLE BEARINGS

History is dull enough, but here's a historical fact that can mean a brighter future for machine shops everywhere Over ten years ago CINCINNATI Grinders were equipped with FILMATIC Grinding Wheel Spindle Bearings. Many improvements have been made in the machines, but the feature which has given the greatest benefit—FILMATIC—has been retained. During these long hard years, over 99% of all FILMATIC bearings—thousands of them—never have required time off for any reason whatever ¶ In addition to their dependable performance, you don't have to pamper FILMATIC bearings. CINCINNATI FILMATIC Grinding Machines take quick roughing or high-quality finish cuts without adjusting the bearings. Spark-out is quicker. No "pecking" of the diamond while truing. ¶ FILMATIC'S perpetual youth, found only in CINCINNATI Grinding Machines, can save time and money in your shop. Specify a CINCINNATI FILMATIC for your next precision grinder. To obtain brief descriptions, write for general catalog M-1646.



A production veteran, this CINCINNATI FILMATIC Centerless has been in continuous operation since 1937 with no down time charged against the FILMATIC Grinding Wheel Spindle Bearings.





These two drawings illustrate the FILMATIC principle. The spindle drive motor cannot start until the bearing compartment is full of clean, filtered oil. **No chance for wear.** During rotation, high pressure oil wedges support and automatically centralize the spindle—**no adjustment required.** Write for publication G-578.

All Cincinnati Grinding Machines and Cincinnati Centerless Lapping Machines are equipped with Filmatic Grinding Wheel Spindle Bearings

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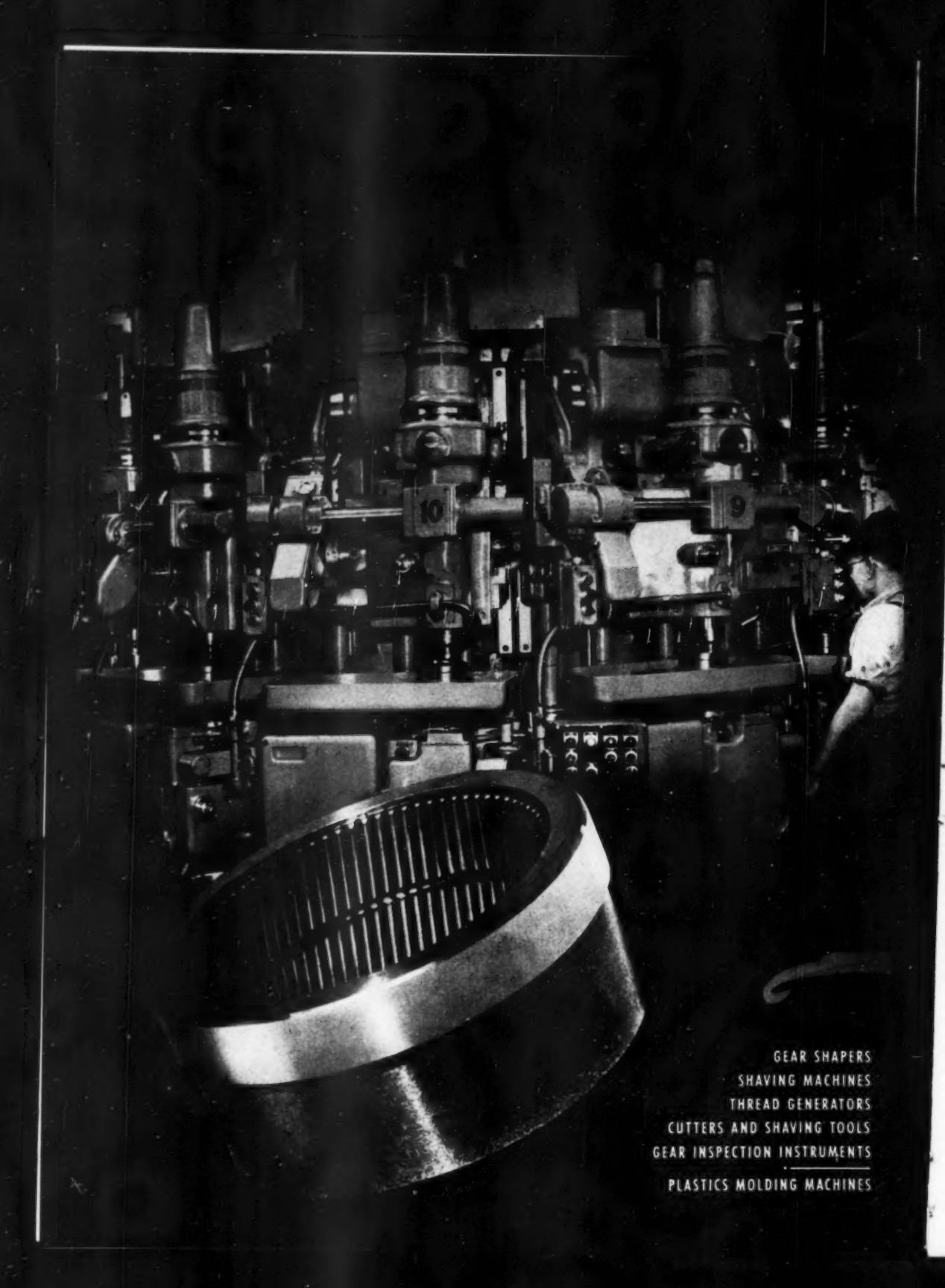

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SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES

SPEED and QUALITY

beyond all precedent in gear cutting

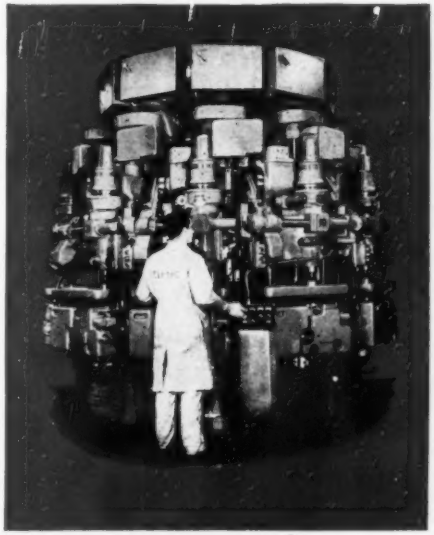
The Big "NO. 10 ROTARY GEAR SHAPER" looms up, now, 12 months after its introduction, as a more revolutionary factor than ever before in the computing of gear cutting costs. Parts are being designed, and shop scheduling laid out, with the gear output capacity concentrated in a ROTARY GEAR SHAPER as the hub of the production plan.

Ten "stations"... up to 510 cutter strokes per minute... feed per stroke as high as .028"... here is power—and—precision which outmodes all other tooling for large-scale mass production. Gear teeth are cut with that extra precision, inherent in the Fellows generating principle.

Automatic work—unclamping and—clamping fixtures leave the operator the simple task of single-motion loading and unloading. Because the 10 "stations" are independently controlled, the set-up may be varied to suit requirements, as follows:

1. All "stations" operating on a single gear, with one or two cuts
2. Pairs or sets of mating gears in balanced alternation
3. Any combination of gears, some spur, some helical, different face widths, etc.

The Fellows No. 10 Rotary Gear Shaper is so important in today's production planning, that we welcome inquiries from those manufacturers whose production can take advantage of its economies. Write or contact whichever Fellows office is nearest.



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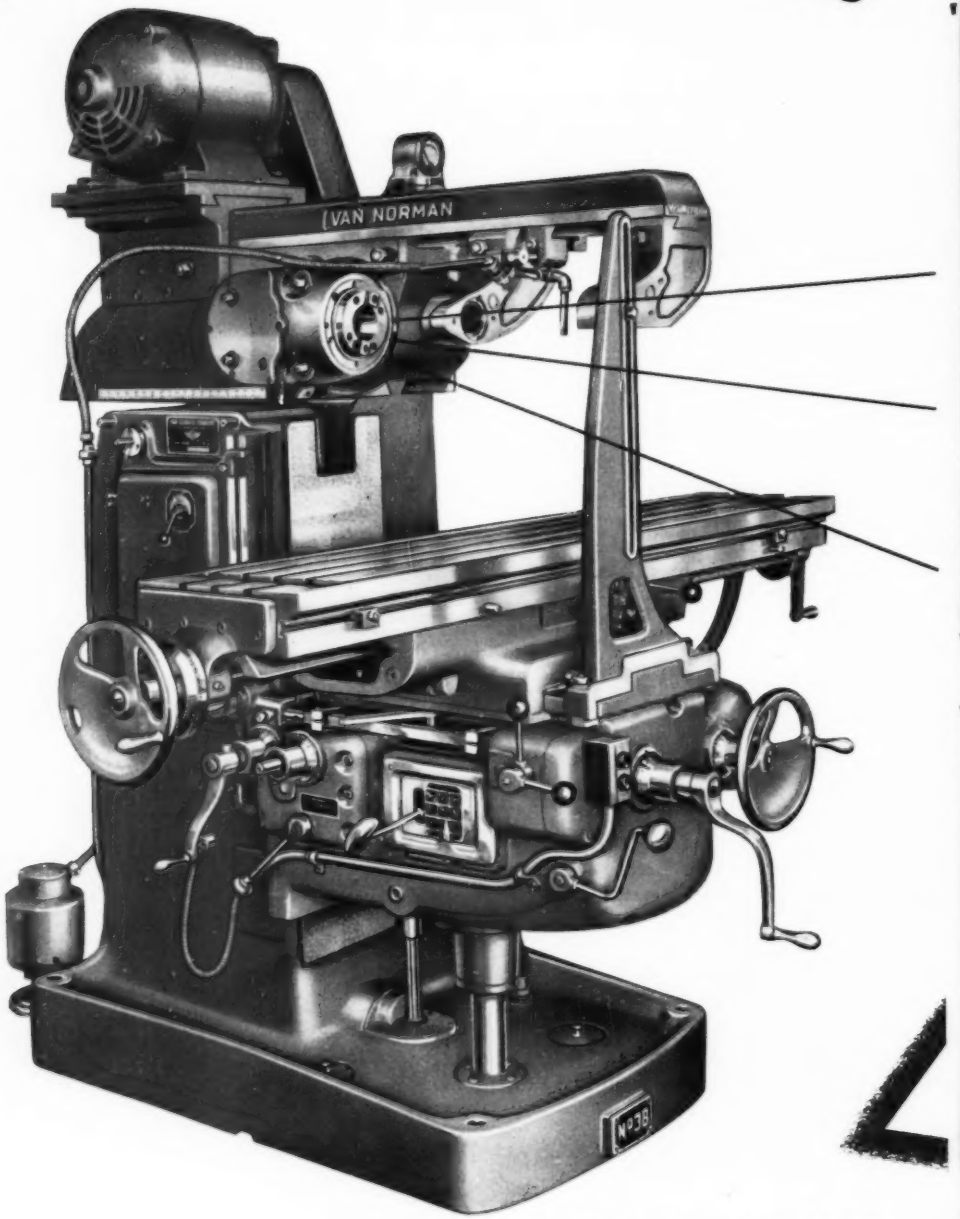
Branch Offices: 616 Fisher Bldg., Detroit 2 • 640 West Town Office Bldg., Chicago 12 • 7706 Empire State Bldg., New York 1.

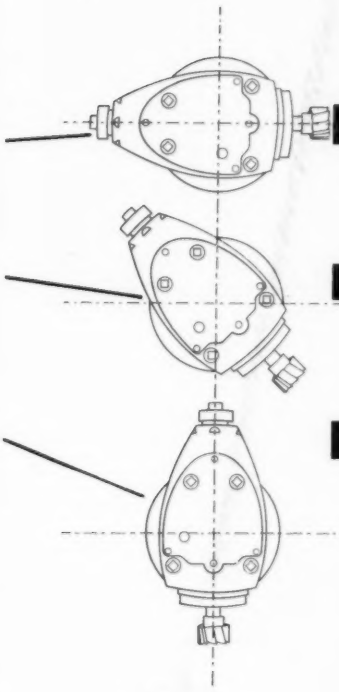
The New Van Norman No. 38



Ram Type Miller

Meets All Milling Requirements

FROM HORIZONTAL TO VERTICAL

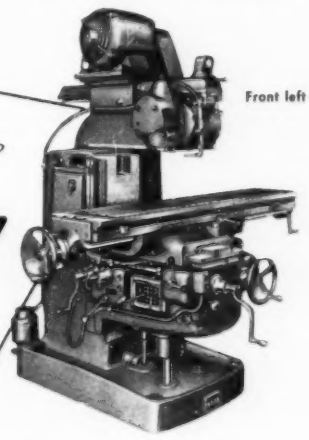


HORIZONTAL Position and lock the cutterhead in horizontal location and you are ready to perform conventional horizontal milling using standard arbors and cutters.

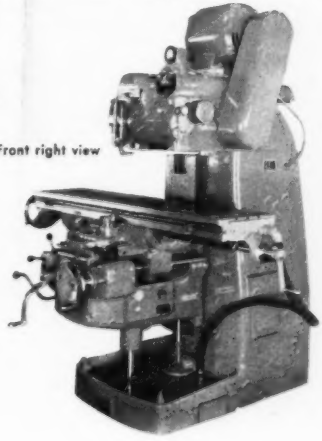
ANGULAR For angular milling set cutterhead in desired angular position, set-up the work and begin milling. Graduated dial makes proper angle positioning easy.

VERTICAL Set cutterhead in vertical position, or 90° on the dial, and the No. 38 becomes a vertical miller.

This rugged Van Norman No. 38 has a 10 hp motor to the cutterhead with spindle speeds up to 2000 rpm . . . a speed instantly available for every type of cut. Write for details today.



Front left view

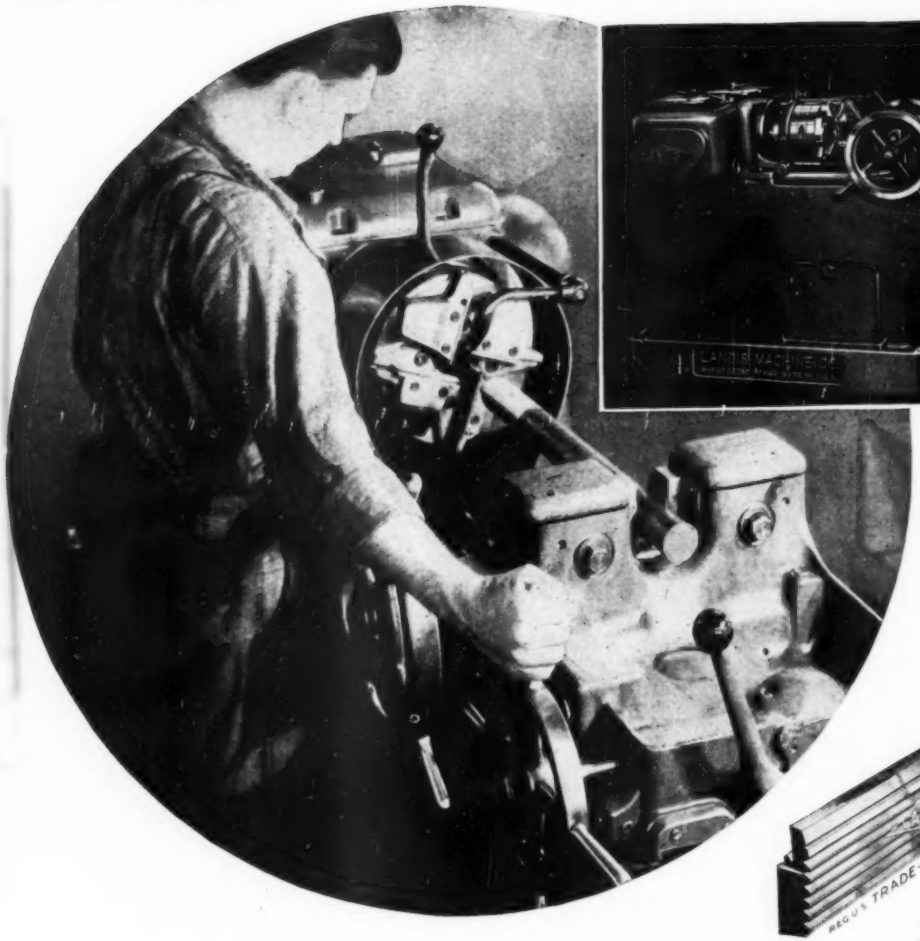


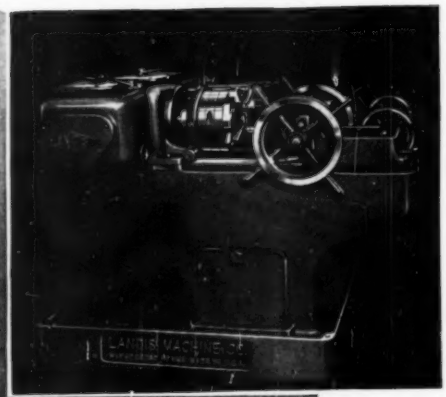
Front right view

Van Norman Company

SPRINGFIELD 7, MASSACHUSETTS

16 Vital Reasons LANDMACO





THE LANDIS CHASER

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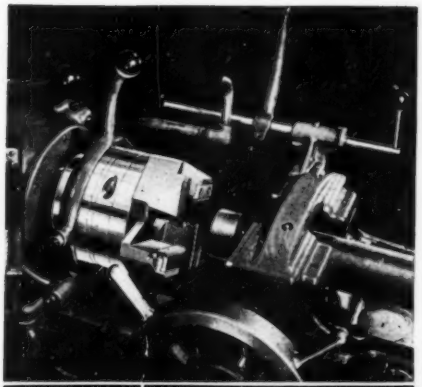
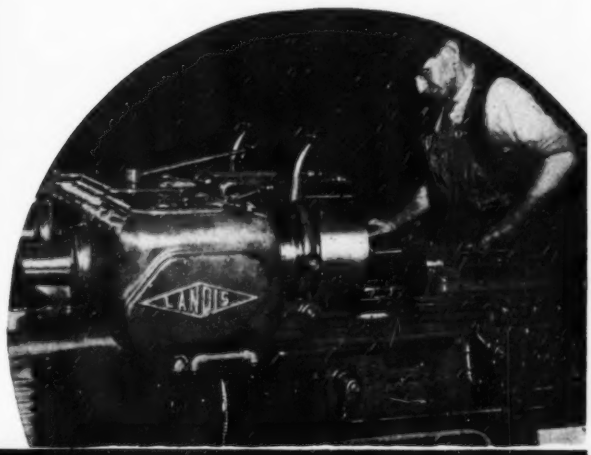
for the Superiority of THREADING MACHINES



The many new and exclusive features of LANDMACO Threading machines combine to assure the greatest possible degree of accuracy, ease of operation and flexibility in making set-up changes.

- Single Pulley Drive.
- Self-contained selective type gear box provides eight spindle speeds.
- Flood lubrication for all gears and bearings.
- Gear type pump driven and automatically reversible.
- Built-in pump can be removed without disconnecting any piping.
- Motor-in-base affords compact and efficient motor drive.
- Friction clutch control.
- Head opens and closes automatically.
- Hand lever for opening and closing head.
- Semi-steel bed of box type reinforced by inner walls.
- Minimum die head overhang.
- Adjustable vise easily lined up with spindle.
- Oil reservoir lubricates guides through felt pads in carriage base.
- Gibbed carriage compensates for wear.
- The heavy rim of vise hand-wheel, giving fly-wheel effect, facilitates gripping of work.
- Guards completely cover and protect guides.



MACHINE CO. WAYNESBORO PENNA. U.S.A.

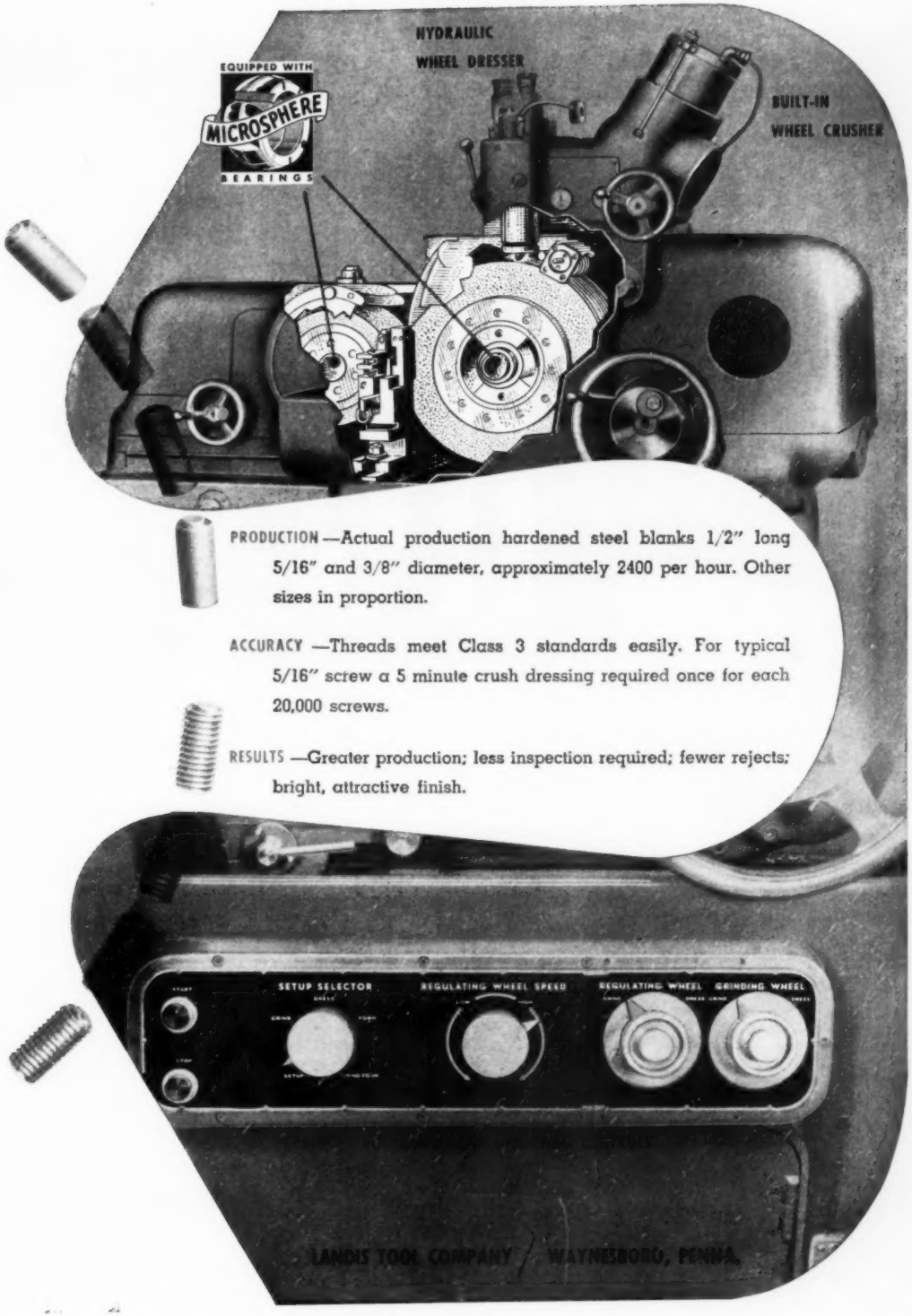
Exceptional Production and Accuracy

with centerless thread grinder

Exclusive vibrating type loader insures continuous flow of blanks thru machine.

LANDIS TOOL
Precision Grinders

Production estimates and tooling suggestions given on the basis of your **blueprints.**



PRODUCTION—Actual production hardened steel blanks 1/2" long 5/16" and 3/8" diameter, approximately 2400 per hour. Other sizes in proportion.

ACCURACY—Threads meet Class 3 standards easily. For typical 5/16" screw a 5 minute crush dressing required once for each 20,000 screws.

RESULTS—Greater production; less inspection required; fewer rejects; bright, attractive finish.

P&W HQ for

Literature *is readily obtainable on any of these Pratt & Whitney products. Just drop a line to* ***Accuracy Headquarters.***

You'll find it particularly desirable to associate your shop with Pratt & Whitney as the source of those tools that occupy key positions in your setup . . . the tools that have a far reaching effect on the quality and overall cost of your own production.

Pratt & Whitney engineers and craftsmen do not claim a corner on high standards of precision and workmanship. But they are eternally aware of the fact that they have a reputation to maintain . . . that the P&W tradition of precision goes back for several generations. This is reflected in every element of every machine they design and build, from the metal itself all the way through construction and assembly to installation and performance. You can sense it when you look at the machines and watch them at work. It is a good thing to have on your team. It is a good thing to keep in mind whenever tools like these come up for consideration.

Pratt & Whitney

Division Niles-Bement-Pond Company
WEST HARTFORD 1, CONNECTICUT

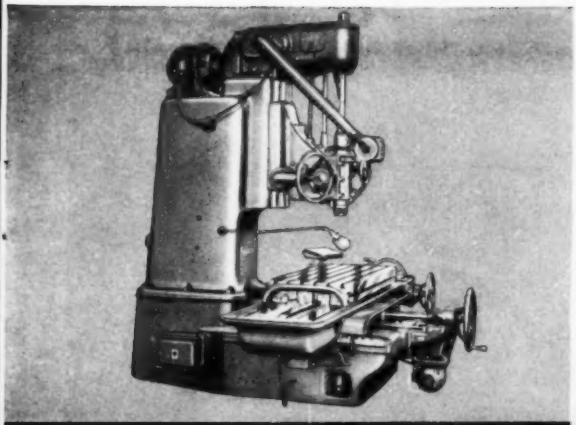
In addition to the Machines illustrated, Pratt & Whitney is Headquarters for

Automatic Lathes, Bench Lathes and Bench Millers, Vertical Millers and Profilers, Die Sinkers, Keller Machines, Jig Grinders, Deep Hole Drillers, Kellerflex Flexible Shaft Equipment.

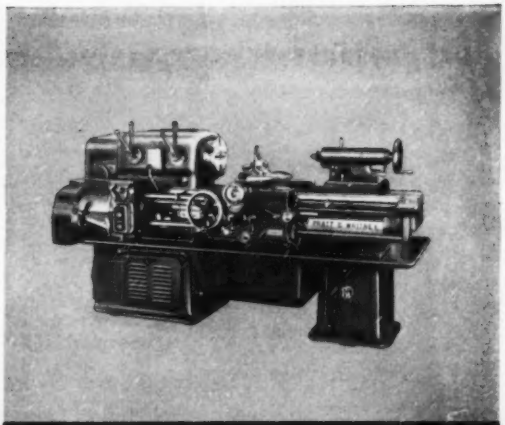
Gages, Gage Blocks, Comparators, Precision Inspection Equipment of all kinds.

Taps, Dies, Reamers, Milling Cutters, Carbide Tipped Tools, Keller Carbide Burs.

There's no better-paying

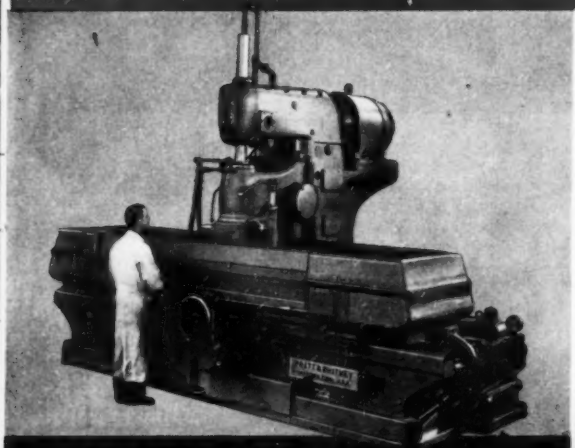


P&W JIG BORER — For basic-accuracy and high-speed precision in the toolroom, in the die shop, in *any* plant. Locates, bores and checks to "tenths". Four sizes for all needs.

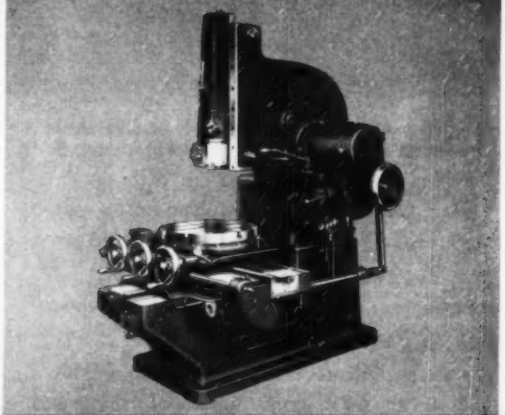


P&W MODEL "C" LATHE — Delivers toolroom accuracy with smooth, quiet, powerful performance. Swing over bed 12", 14" and 16". *The standard by which all fine lathes are judged.*

accuracy



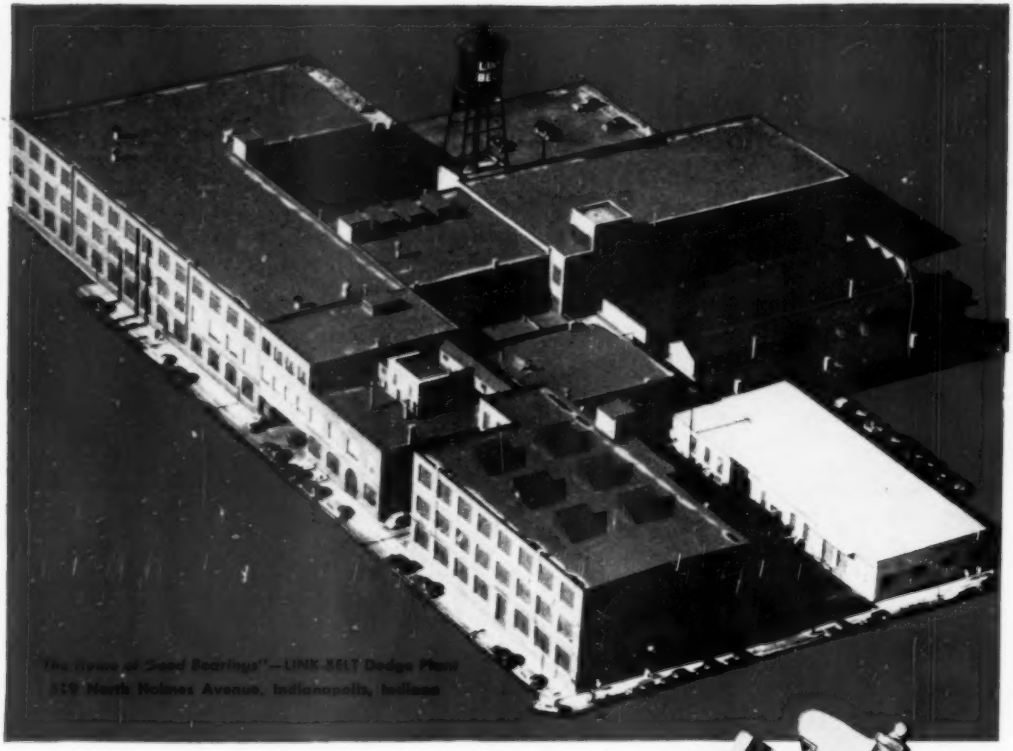
P&W VERTICAL SURFACE GRINDER — With hydraulic table speeds . . . always the right speed available for fast precision-grinding of almost any material. Several sizes . . . 26" heavy duty machine illustrated.



P&W VERTICAL SHAPER — Machines irregular-shaped work usually without fixtures or change of setup. Sizes 6" and 12" (illustrated). *The handiest machine in the shop.*

investment than the right tools for the job

One LINK-BELT Plant devoted *Solely* to bringing you better bearings—*Quickly*



"The Home of Good Bearings"—LINK-BELT Dodge Plant
519 North Holmes Avenue, Indianapolis, Indiana

Meeting industry's ever-increasing demands for ball and roller bearings that offer the desired combination of free-rolling action, self-alignment, and long life is no small-sized job.

That's why the entire capacity of Link-Belt's Dodge Plant in Indianapolis is devoted to this important task.

From the receipt of housing castings furnished by sister plant foundries to shipment of finished mounted bearings, alert design engineers, skilled craftsmen and the most modern bearing production machinery work hand-in-hand to turn out the bearings that enable users to TURN SHAFTS EFFICIENTLY.

Cut-away view of Series 200 Ball Bearing Pillow Block

LINK-BELT COMPANY

Indianapolis 6, Chicago 9, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Distributors in Principal Cities

11,387

LINK-BELT — *Ball and Roller* **BEARINGS**

Potter & Johnston Tooling

It takes years of experience and a special kind of engineering ingenuity to dope out the right combination of operations, turret face by turret face that results in better work and more of it per day at lowest cost per unit.

That is the particular specialty of P&J tooling engineers — proved time and again by outstanding parts production performance in the field.

That is why it is to your very great advantage to take your production problems to P&J — see what we have to suggest when you send us your parts or prints.

Tooling recommendations, estimates and time studies cost you nothing and may show the way to big savings. How about it?

HERE IS THE JOB,
ONE TURRET FACE AFTER ANOTHER

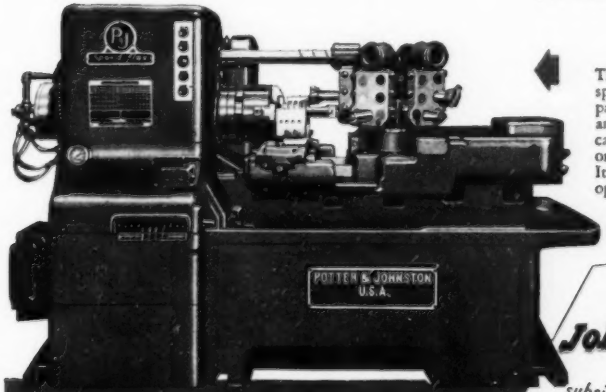
1st T.F.: Bore hole halfway; rough turn O.D.; face end; rough and finish form "V" grooves; face flange.

2nd T.F.: Bore balance of hole; bore C'bore at front end; finish turn O.D.; face end.

3rd T.F.: Finish bore hole and C'bore.

4th T.F.: Machine grooves in bore (slide tool)

5th T.F.: Size bore hole 2.047" dia.



HERE IS THE MACHINE

THE P&J 3U SPEED-FLEX

This Potter & Johnston Automatic Turret Lathe is specially designed for high speed production of small parts. It is equipped with four automatic speed changes and three automatic feed changes, electro-pneumatically controlled. It effects split second change of speeds or feeds or shift from the feed to the rapid traverse. It provides independent or simultaneous cross-slide operation with selected turret faces or with all six.

3U SPEED-FLEX

Potter & Johnston Company
Pawtucket, R. I.
subsidiary of Pratt & Whitney
Division Niles-Bement-Pond Company

ELIMINATE
MACHINE READJUSTMENTS
OFF WITH THE OLD
ON WITH THE NEW
. . . and Start Grinding!
NORTON
32A60 J8VBE
NORTON
ABRASIVES

Increase Production with these new precise NORTON *Internal* GRINDING WHEELS

BECAUSE internal grinding wheels are small, they wear out quickly. Thus wheel changes are frequent and any reduction in wheel-change time can materially increase production. That's why the new Norton "precision-made" internal grinding wheels are so popular.

The grinding action of these new wheels is so uniform—not only in each lot but from lot to lot as well—that there's no lost time for machine re-adjustments when wheels are changed. The operator just slips off the worn wheel, snaps on a new one, starts grinding—***no fussing with feeds and speeds.*** He gets just the same grinding action that he had a few seconds before, or the day before, or the week before.

Produced by a radically new, Norton-developed manufacturing process, these wheels have a uniformity in dimensions and in grinding action far ahead of anything previously obtainable in a ceramic product.

Available with All Norton Abrasives

W-1227

The advantages of this new NORTON manufacturing process are available with all Norton abrasives—ALUNDUM*, the sensational 32 ALUNDUM*, 38 ALUNDUM*, 57 ALUNDUM*, 37 CRYSTOLON* and 39 CRYSTOLON* abrasives.

Faster Service, Too

The new Norton manufacturing process with its electric kilns produces these improved internal grinding wheels in hours instead of days. This means improved delivery.

If you are not already cutting internal grinding costs with these new Norton wheels it will pay you to try them. See your Norton abrasive engineer or Norton distributor.

*Trade Mark Reg. U. S. Pat Off.

Precise Size

Grinding wheels made by the new Norton manufacturing process are dimensionally accurate within extremely close limits.

Precise Balance

Because of precision molding and precision burning, precise balance is inherent in the wheels—it's there to start with and it stays there as the wheels wear down.

Precise Grinding Action

The control methods of the new process have brought a new uniformity to grinding action—throughout the life of each individual wheel, from wheel to wheel and from lot to lot.

NORTON COMPANY, WORCESTER 6, MASS. • Warehouses in Five Cities • Distributors in All Principal Cities

Now CHROMIUM PLATED FOR LONGER SERVICE LIFE

Another BIG STRIDE in Extra SERVICE

SINGLE END
Size 1.510" (38mm) and over

DOUBLE END
Under 1.510" (38mm)

GAGING SURFACES are portions of a sphere

Chromium Plated STANDARD DuBo* PLUG GAGES

DuBo Plug Gages have already won an excellent reputation for long-enduring service. Exceptionally long wearability is inherent in their basic design. *Now chromium plated gaging surfaces, available at very little extra cost, add a tremendous plus to their service life.*

For long runs and the more abrasive materials specify *Chromium Plated* DuBo Gages.

Be Sure To Write For DuBo Bulletin

*Patents Pending

LIGHT IN WEIGHT

DuBo Gages weigh 70% to 80% less than cylindrical plug gages of equivalent size.

EASY TO ENTER

Simply tip handle slightly above bore axis. Enters even undersized bores easily.

DEFINITE CHECK

Whether or not handle drops freely below center is definite yes-or-no answer.

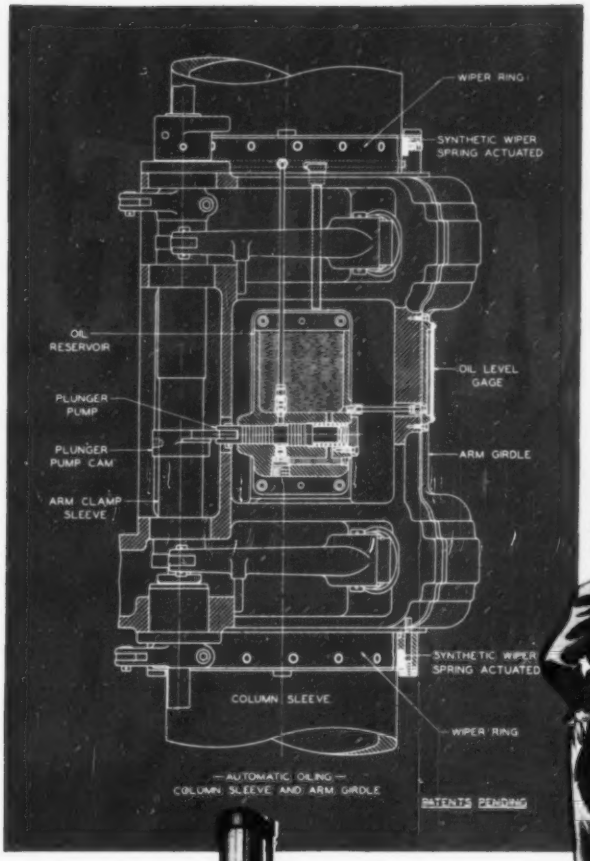
STANDARD GAGE CO., INC.

Poughkeepsie, N.Y.

Just a memory now

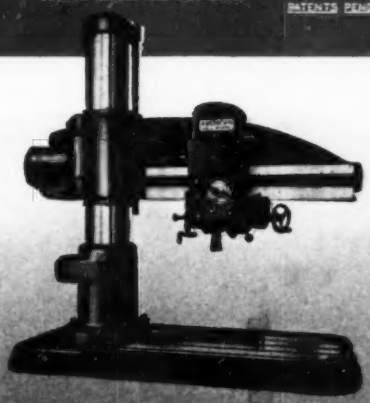
Column Scoring a thing of the past...

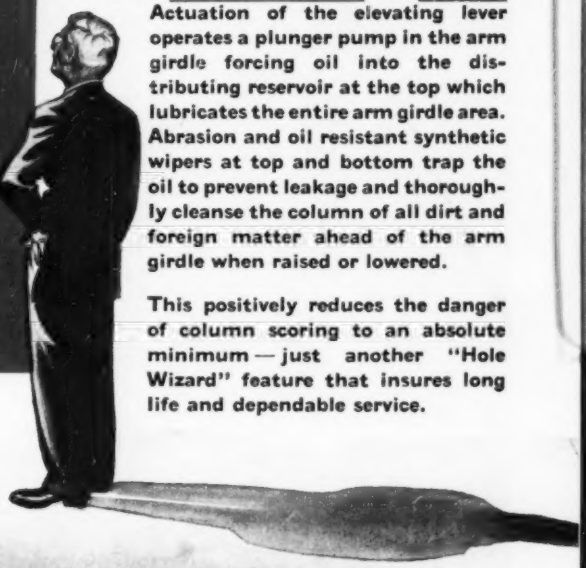
We've done something about it—



On the new "AMERICAN" Hole Wizard Radial the arm girdle and its mating column area are automatically oiled and cleansed. Actuation of the elevating lever operates a plunger pump in the arm girdle forcing oil into the distributing reservoir at the top which lubricates the entire arm girdle area. Abrasion and oil resistant synthetic wipers at top and bottom trap the oil to prevent leakage and thoroughly cleanse the column of all dirt and foreign matter ahead of the arm girdle when raised or lowered.

This positively reduces the danger of column scoring to an absolute minimum — just another "Hole Wizard" feature that insures long life and dependable service.



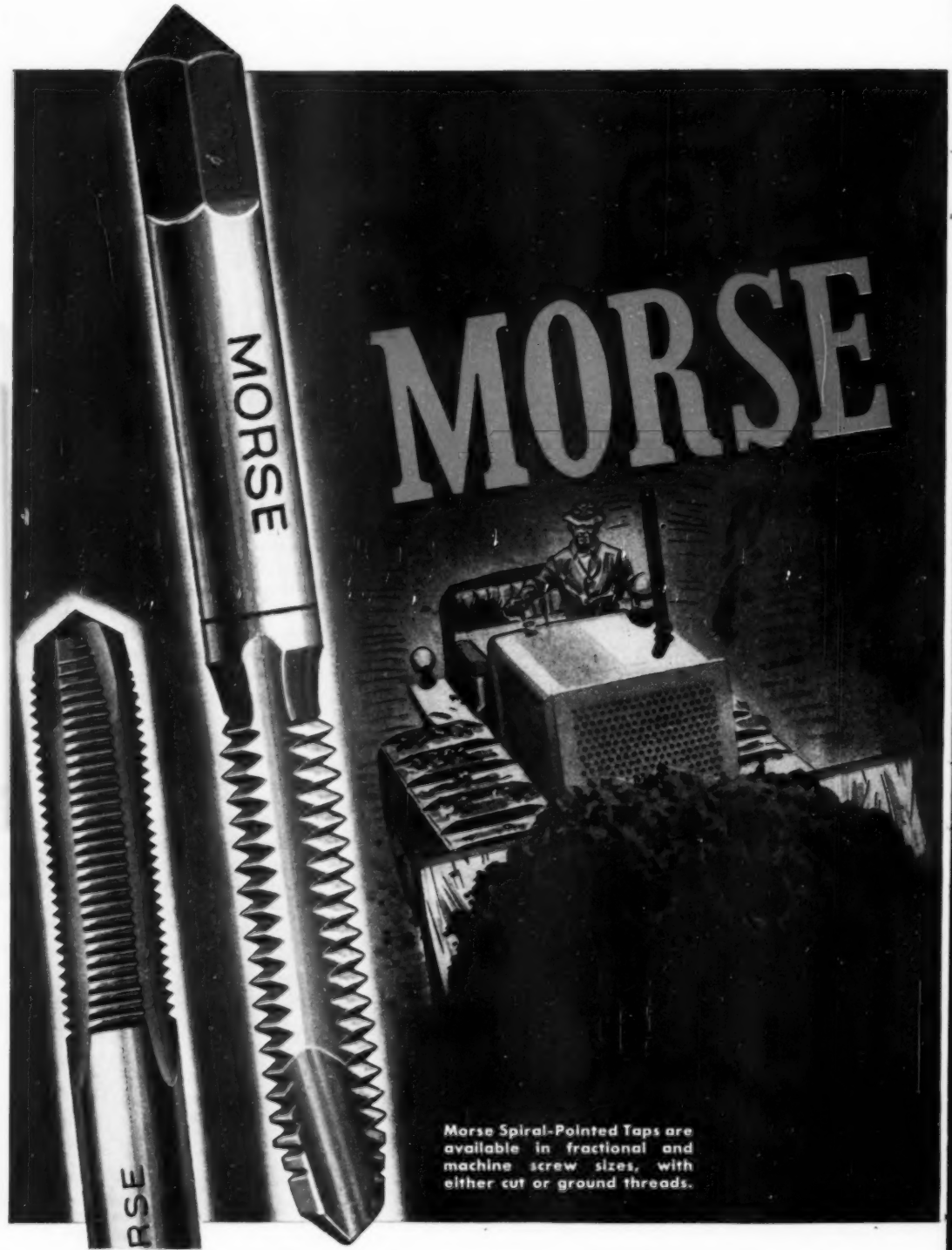


Bulletin No. 327 describes this and other exclusive "Hole Wizard" features of proven value. Want one?

THE AMERICAN TOOL WORKS CO.

Cincinnati, Ohio, U. S. A.

LATHES AND RADIAL DRILLS


MORSE
MORSE
RSE
Morse Spiral-Pointed Taps are available in fractional and machine screw sizes, with either cut or ground threads.

Spiral-Pointed TAPS Cut Cleaner Threads Faster

...because they have Extra Strength to "Bulldoze" the Chip Ahead of the Tap

Here's the tap for top performance in tapping through-holes (not blind) in any metal or material. For the Morse Spiral Point keeps chips out of the flutes, forces them *ahead* of the tap, and *out* the bottom of the through-hole. So the tap cuts continuously, without ever backing it up to clear loose chips.

This means faster tapping, cleaner threads, and no damage to any threads that may be already cut in the work.

What's more, tap flutes don't have to be as deep as on regular taps . . . that's why Morse Spiral-Pointed Taps have heavier cross-section, greater strength, *far greater resistance to breakage.* And these chip-free flutes mean freer flow of coolant, right down to the cutting edge.

So for top tapping efficiency and lowest tap costs, ask your Morse-Franchised Distributor, today, to recommend the right Morse Spiral-Pointed Tap for your job.

SOLD EXCLUSIVELY THROUGH MORSE-FRANCHISED DISTRIBUTORS

Accuracy, Quality, Uniformity: the MORSE Code of Cutting-Tool Manufacture

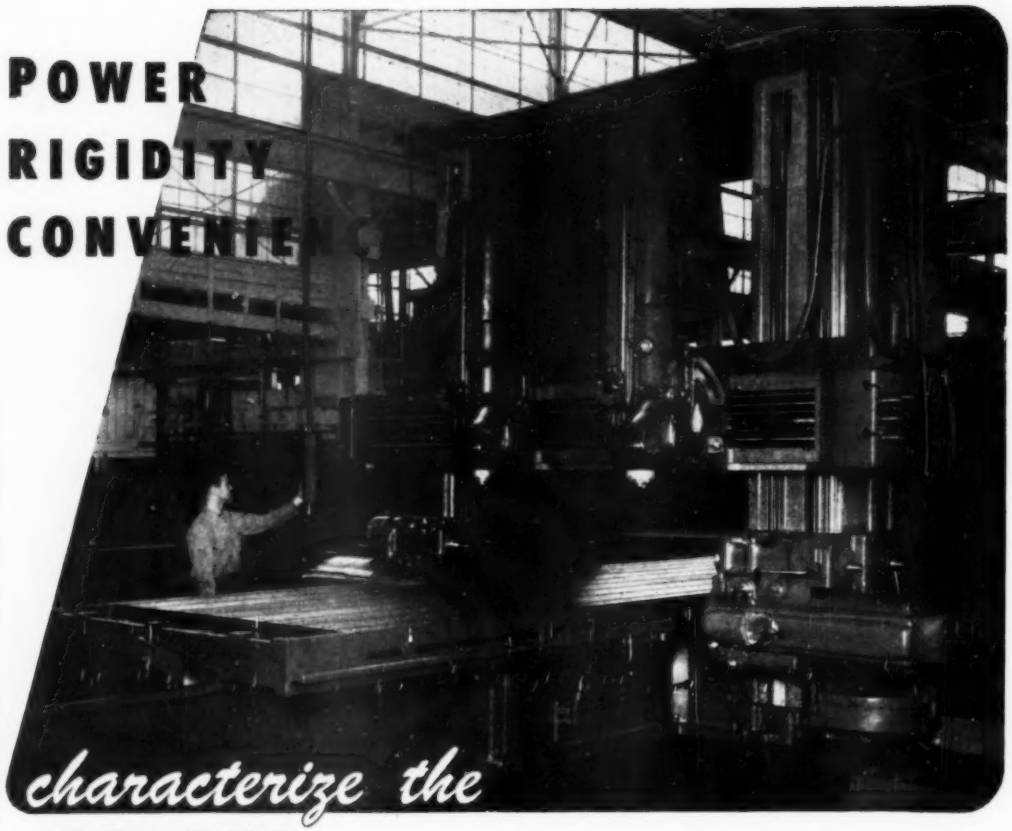
MORSE TWIST DRILL & MACHINE COMPANY

NEW BEDFORD, MASSACHUSETTS

A DIVISION OF VAN NORMAN COMPANY

BRANCH WAREHOUSES: NEW YORK, DETROIT, CHICAGO, DALLAS, SAN FRANCISCO

POWER
RIGIDITY
CONVENIENCE



characterize the

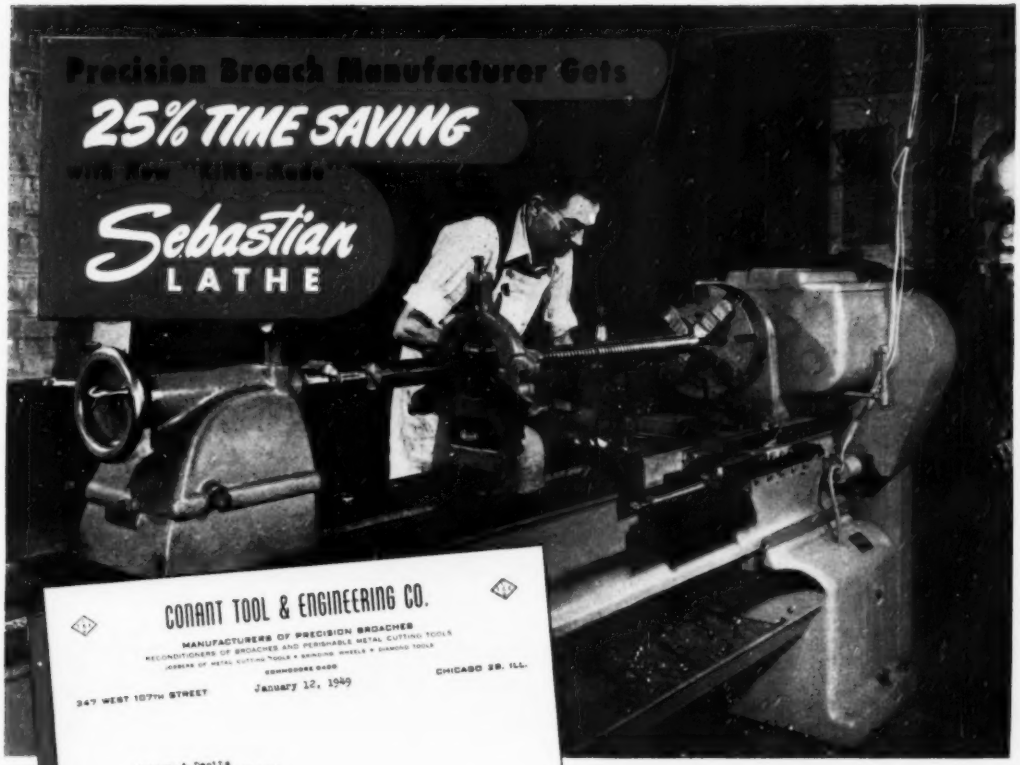
GRAY MILLING MACHINES

YOU NEED all three qualities for maximum production. Power without Rigidity will cause poor work and short tool life. Rigidity without adequate Power means that you cannot drive modern cutting tools at maximum speeds, feeds, and depth of cut, but Power and Rigidity without Convenience will result in waste man hours and consequent inefficient operation. Therefore, we say you must have Power, Rigidity and Convenience for Maximum Production, and the Gray Milling Machine has all three.

The G.A. **GRAY** *Company*

CINCINNATI 7, OHIO, U. S. A.

planers • milling planers
planer type milling machines
horizontal boring machines



CONANT TOOL & ENGINEERING CO.

MANUFACTURERS OF PRECISION BROACHES
RECONDITIONERS OF BROACHES AND PERISHABLE METAL CUTTING TOOLS
GRINDERS OF METAL CUTTING TOOLS • GRINDING WHEELS • DIAMOND TOOLS

347 WEST 107TH STREET — CHICAGO 28, ILL.

January 12, 1949

Donberg & Danits
400 South Clinton Street
Chicago, Illinois

Attention: Mr. Theo. Fieldman,
Sales Promotion & Advertising

Gentlemen:

We have been operating in our plant since about the middle of October a 20" x 120" Sebastian Lathe which was purchased from your Company, and we are more than pleased to tell you of the fine results it has given us.

We have been roughing out large round broaches made of 18-4-1 high speed steel up to 4-1/2" in diameter by 62" overall length, adaptor plates and broach horns up to 16" in diameter, and we have done a considerable amount of thread cutting and find the machine to be very satisfactory in every respect.

Since we have been using this machine we have realized about a 25% saving in time and when in the market for additional equipment would have no hesitancy about purchasing additional Sebastian Lathes.

Yours very truly,

CONANT TOOL & ENGINEERING COMPANY

E. D. Conant, President

EDC:ans

20" Sebastian Lathe with 10' bed, roughing out teeth for involute spline broach at Conant Tool & Engineering Company.

●

You'll buy performance like this when you specify Sebastian Geared Head Lathes. The modern Sebastian is widely recognized as an outstanding leader in dependable accuracy, ease of operation, long service life.

This decidedly *finer* lathe is manufactured by "King," to the same precision standards which have made KING Vertical Boring & Turning Machines renowned the world over.

For illustrated description and specifications, write now for Catalog S-1 (Standard Lathes) and S-101 (Special Type Lathes—Gap, Clutch & Brake, etc.)

Standard Lathes in 12", 16", and 20" sizes. All lathes equipped with 8-speed geared head.

American Steel Foundries

KING MACHINE TOOL DIVISION

CINCINNATI 29, OHIO

Builders of King Vertical Boring & Turning Machines and Sebastian Lathes

Westinghouse Air Conditioning System with Kathabar Humidity Control installed by Natkin & Co.

The Shell Oil Company was about to invest $1,300,000 for a new laboratory in Houston, Texas, for oil research. Plans called for extremely critical atmospheric condition control. Temperatures and humidity had to be held constant within close limits. It was essential that the air be kept as free of dusts and pollens as modern science would permit. Laboratory fumes had to be eliminated quickly. Westinghouse Air Conditioning with PRECIPITRON*, the electronic air cleaner, supplied the answer to the air cooling and air cleaning problems—not with special equipment, *but with standard, matched, Westinghouse components.*

Expensive "special" jobs can often become routine jobs when you specify Westinghouse, because Westinghouse makes more products to put air to work in more different ways, than any other manufacturer. This means undivided equipment responsibility, coordinated system operation, flexibility and economy—important benefits that can hardly be overlooked when you are thinking about air conditioning, air handling, or air cleaning. Call your nearest Westinghouse office, Air Conditioning Distributor, or write to Westinghouse Electric Corporation, Sturtevant Division, Hyde Park, Boston 36, Massachusetts.

Westinghouse

Sturtevant Division

AIR HANDLING UNITS

UNIT HEATERS

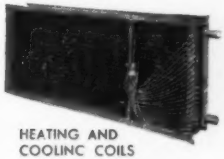
CENTRIFUGAL FANS

REFRIGERATION CONDENSERS

HOW SHELL BOUGHT PRECISION AIR CONDITIONING FOR LABORATORY ATMOSPHERE CONTROL

REFRIGERATION COMPRESSORS

EVAPORATIVE CONDENSERS



HEATING AND COOLING COILS

UNIT AIR CONDITIONERS

ROOM AIR CONDITIONER

PRECIPITRON*
(ELECTRONIC AIR CLEANER)

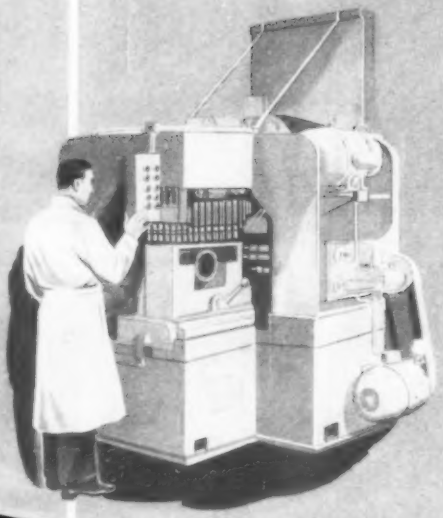
Everything that puts air to work for Every application

J-80132

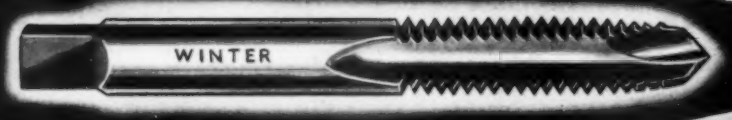
*Reg. U. S. Pat. Off.

WINTER

TAPS IN ACTION



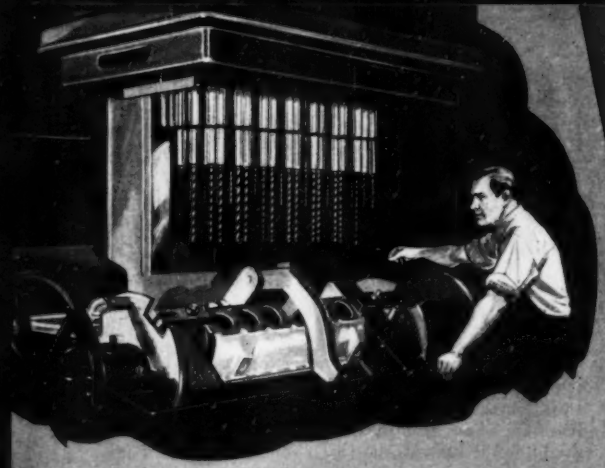
WINTER CHIP DRIVER TAPS are among the strongest taps made, and are well-suited for all classes of work except blind holes. They make a shearing cut that turns the chips ahead of the tool, permitting better lubrication of the cutting edges. This reduces the danger of clogging and breakage, and makes operation at higher speeds possible. Winter Chip Driver Taps are part of the complete Winter line of taps and dies, which also includes hand, machine screw, nut, pipe, pulley, stove bolt, and tapper taps.



Always At Your Service

YOUR LOCAL DISTRIBUTOR carries a complete stock of Winter taps on his shelves—as close to your tapping problems as the telephone on your desk.

WINTER BROTHERS COMPANY • Division of the National Twist Drill and Tool Company
Rochester, Michigan, U. S. A. Distributors in Principal Cities • Branches in New York, Detroit, Chicago, San Francisco



NATIONAL METAL CUTTING TOOLS ON THE JOB

NATIONAL TAPER SHANK AND STRAIGHT SHANK TWIST DRILLS are recognized for the ability to maintain high production. This is the result of careful material selection, design based on many years' experience, and skilled manufacture. National's complete line of drills also includes many other types such as three- and four-groove drills, jobber and wire drills, combined drills and countersinks, and special drills. In addition, National makes reamers, milling cutters, counterbores, end mills, hobs, and special tools.

Call Your Distributor

LEADING DISTRIBUTORS EVERYWHERE offer complete stocks of NATIONAL cutting tools. Call them for cutting tools or any other staple industrial product.

NATIONAL TWIST DRILL & TOOL ROCHESTER, MICH., U.S.A.

National

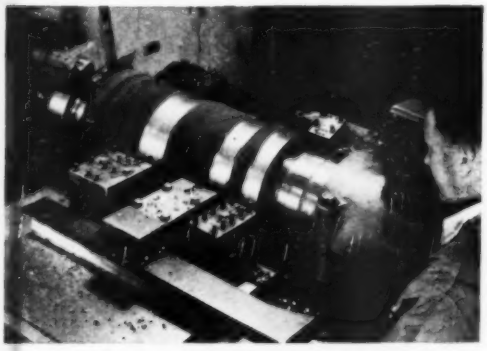
NATIONAL TWIST DRILL AND TOOL COMPANY • Rochester, Michigan, U.S.A.

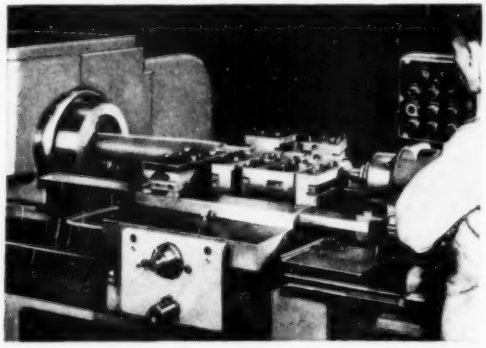
Distributors in Principal Cities • Factory Branches: New York • Chicago • Detroit • Cleveland • San Francisco

Heavy Turning Jobs...

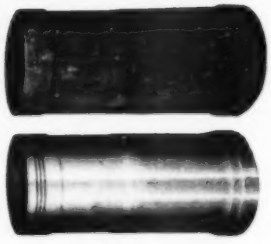
On SUNDSTRAND Multiple Tooled 75 H.P. Automatic Lathes

If you have large work requiring turning and heavy stock removal, here's the lathe for the job. This heavy duty automatic lathe (17″ swing over slides) has the same highly productive features of all Sundstrand Automatic Lathes . . . quick cycle changeover, simplicity in adjustments, wide range of carriage cycles and feeds and speeds together with a high rapid traverse rate. *In addition, a 75 horsepower spindle motor* provides ample power for heavy cuts and carbide cutting tools. Here are a few examples of heavy turning jobs done on the Sundstrand Model 16. If you have similar work, call in a Sundstrand engineer.





66 Hours Saved Turning Lot of 20 Cylinder Liners



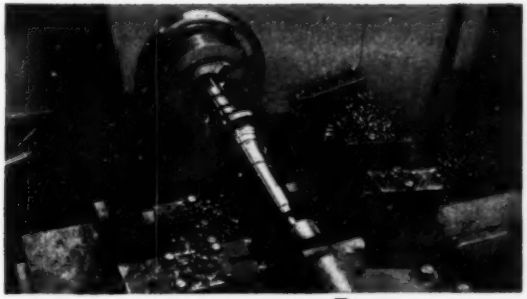
Liners are 32″ long by 15¼″ diameter and are processed in lots of 20 pieces. With old machines and method, roughing time was 60 hours for 20 pieces. Sundstrand multiple tooled Model 16 rough turns same number of parts in only 10 hours. Tooling is then changed for finish turning. Five different diameters, three .253″ grooves in the O.D. and an additional groove in the end wall diameter are completed in this operation. Finish turning time was cut from 24 hours to 8 hours. Part illustrations show rough and finish turned cylinders.

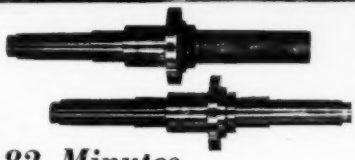
300% Production Increase On Heavy Tractor Shafts

This tractor shaft is a steel forging (285 Brinell). It is rough turned, faced and formed complete in two operations on a Sundstrand Model 16 Automatic Lathe. Lot size is 350 pieces. First operation tooling shown above has nine carbide tipped tools. Maximum depth of cut is ⅞″ — HP consumed at peak load is 79. Over 18 pounds of metal is removed per minute. Production on the Sundstrand is over 5 per hour compared to 1¾ by the former method. Here is a good example of the use of multiple tooling and an automatic cycling 75 HP Sundstrand Model 16 Lathe for improving turning production.

SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS, U.S.A.

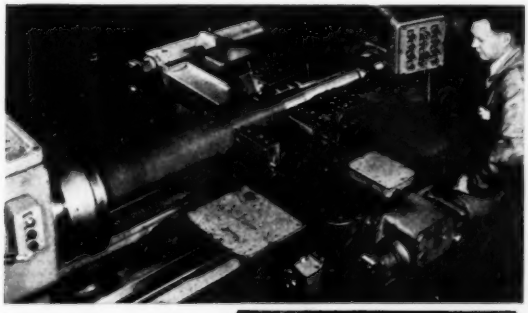
RIGIDMILS • FLUID-SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

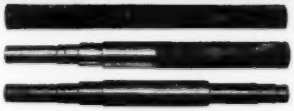




Turning Time Cut From 23.7 to 3.82 Minutes

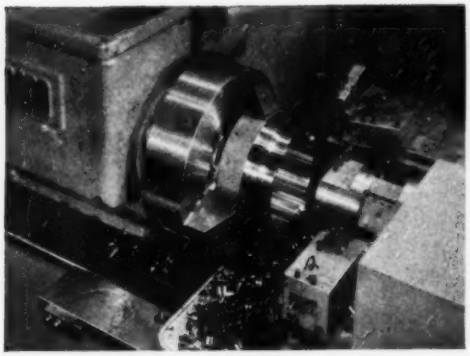
This track sprocket shaft is 1045 steel forging with a hardness of 212 Brinell. It is completely turned in two set-ups on a Sundstrand 75 HP Model 16 Automatic Lathe which has ample power to make full use of multiple tooling and carbide tipped tools. The first operation which is illustrated above is rough turning, facing and forming one end with nine tools. H.P. consumed at peak load is 84 — maximum depth of cut is 7/8". Production on the Sundstrand is 8 shafts per hour compared to 1.6 shafts by the former method. Here is another good example of the fast metal removal possibilities of the Sundstrand Model 16 Automatic Lathe.





85 lbs. of Steel Removed in 9 Minutes

The generator shaft shown above is 63 inches long and is of 1045 steel bar stock. It requires the turning of five diameters on one end, four on the other. One end of a lot is turned in first operation, then shaft is reversed, tools re-set and opposite end turned in second operation. The generator shaft is only one of over 30 different shaft parts run on the Model 16 Automatic Lathe.



Turning, Facing, Boring and Chamfering Gear Assemblies

These split gear assemblies are machined in two operations. In the first, the part is chucked on the rough O.D. One-half of O.D. is then turned together with boring, facing and chamfering operations on one end. Part is then reversed and same operations performed on opposite end. Material is an extremely hard alloy steel of 400 Brinell. Speed is 366 S.F.P.M. — maximum depth of cut is 5/8" — production is 10 per hour for each operation.

FREE

Additional Data

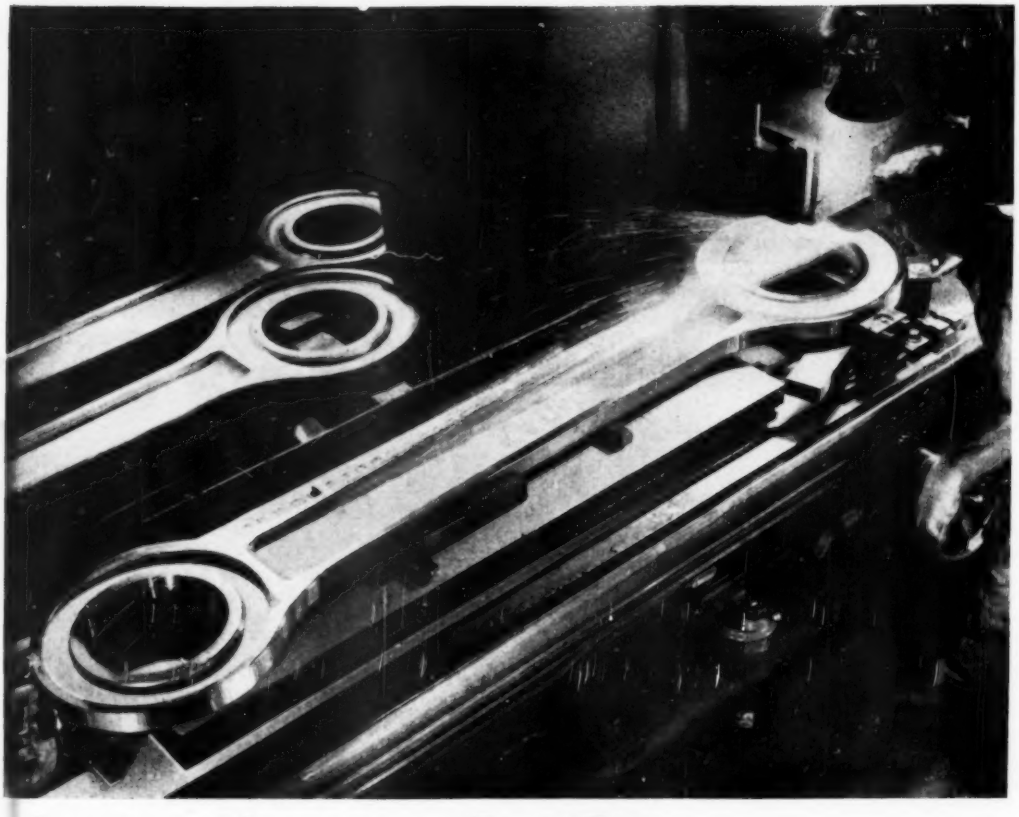
How you can save time on turning large parts is further explained in this free folder covering engineering data and specifications on the 75 horsepower Sundstrand Automatic Lathe. Write for your copy today. Ask for bulletin 181

SUNDSTRAND

MACHINE TOOL COMPANY

2533 Eleventh St. • Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

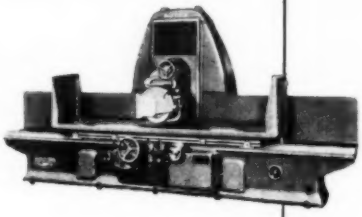


Grinding Locomotive Side Rods

on MATTISON GRINDER

This illustration shows a locomotive side rod being accurately ground on a Mattison Grinder. Grinding provides a flat surface for locating boring operations and permits checking alignment of rod while on locomotive. In addition to side rods, the Mattison Grinder handles a variety of other parts for railroad shops such as links, crosshead guides, reverse guides, valve guides, reverse valve parts, front and back engine guides, etc.

In all sizes from 12" to 36" wide to 192" long, Mattison Grinders are ruggedly and accurately built to do high-powered precision grinding. It is possible to grind one large part or many small parts with equal speed and facility. To determine what Mattison Grinders can do for you, send us blue prints of your work for production estimates.



Write for Free Set-Up Book showing how others have reduced time and cut costs with Mattison Grinders.

MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS

What's in
VERMONT
this month?

CARBIDE DIE LIFE EXTENDED BY GRINDING

THE LIFE of a carbide die depends on two factors, surface finish and geometry. The majority of carbide dies today are finished by a slow process of hand lapping. This produces a surface finish which apparently will stand a lot of abuse. But the geometry of the hole is a random proposition in the light of recent developments.

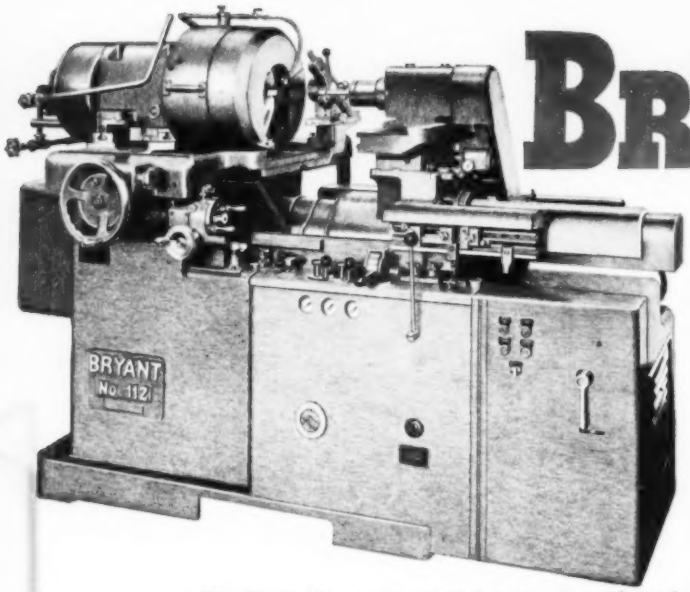
Bryant Internal Grinders are built to grind holes which have fine geometry — a geometry which is uniform in all pieces. The life of dies ground on Bryant grinders has been extended two to six times over dies finished by the old method. This is due to the accuracy of the angles, the roundness of the holes, and the fine finish.

A Bryant machine will pay for itself in a short time by extending the life of the die and by substantially reducing the cost of refinishing worn dies.

This is an example of how new machine tools, capable of working to very fine tolerance of size and finish, can pay their own way.

It won't cost to inquire.

Bryant Chucking Grinder Co. • Springfield, Vermont, U.S.A.



BRYANT

Number 112

HYDRAULIC INTERNAL GRINDER

The Bryant No. 112 is a general purpose internal grinder for production work, yet with all the features necessary for quick changeover, with minimum effort, for tool room jobs. Other Bryant equipment will grind work through the complete range up to 60 inches in diameter. Write to the factory for full information.

SPECIFICATIONS

Total swing	16 inches
Maximum traverse	20 inches
Maximum hole depth	8 inches
Will grind included angle	90°
R.P.M. of work spindle	100 to 1,000 R.P.M.
Net weight	5,500 lbs.
Floor space — 90 inches x 60 inches (with coolant tank)	

SLIDES
Wheelhead on Bryant cylindrical slide base; workhead (for cross feed) on anti-friction bearings.

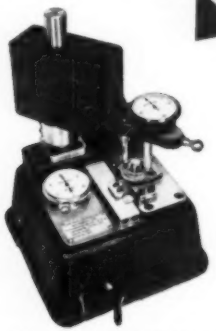
WORKHEAD
Precision ball bearing spindle. Infinitely variable and reversible spindle by hydraulic motor. Standard cam lock spindle nose.

WHEELHEAD
Interchangeable quill type, belt driven, anti-friction bearings; will use Hi-Frequency Wheelhead for 100,000 R.P.M.

TRAVERSE
Infinitely variable, hydraulically powered.

CROSS FEED
Variable speed automatic feed. Precision feed graduated in .0001" increments.

You can *"See the Difference"* with a BRYANT GAGE



THE BRYANT SQUARENESS-OF-FACE GAGE not only shows acceptability of threaded parts, but also visually indicates the right angularity of the face with the pitch diameter of the thread. The squareness-of-face gage may be mounted on any Bryant bench gage.

It is no longer necessary to "feel for fit" with plug and ring gages when inspecting threads. The Bryant Thread Gage shows, on a dial indicator, whether a thread will assemble properly with its component.

At a glance, anyone can compare threaded parts with a master and tell the whole story immediately — size, presence of burrs, out-of-roundness, accumulated inaccuracies of pitch, lead, diameter and thread form.

It's fast too. The design incorporates three thread segments, two stationary and one movable. The segments are operated by a thumb lever — the part is dropped between the segments — the lever is released, causing immediate contact of segments to threads — a one third turn of the part inspects it all over.

Send samples or drawings for a complete story on how Bryant can save inspection money for you.

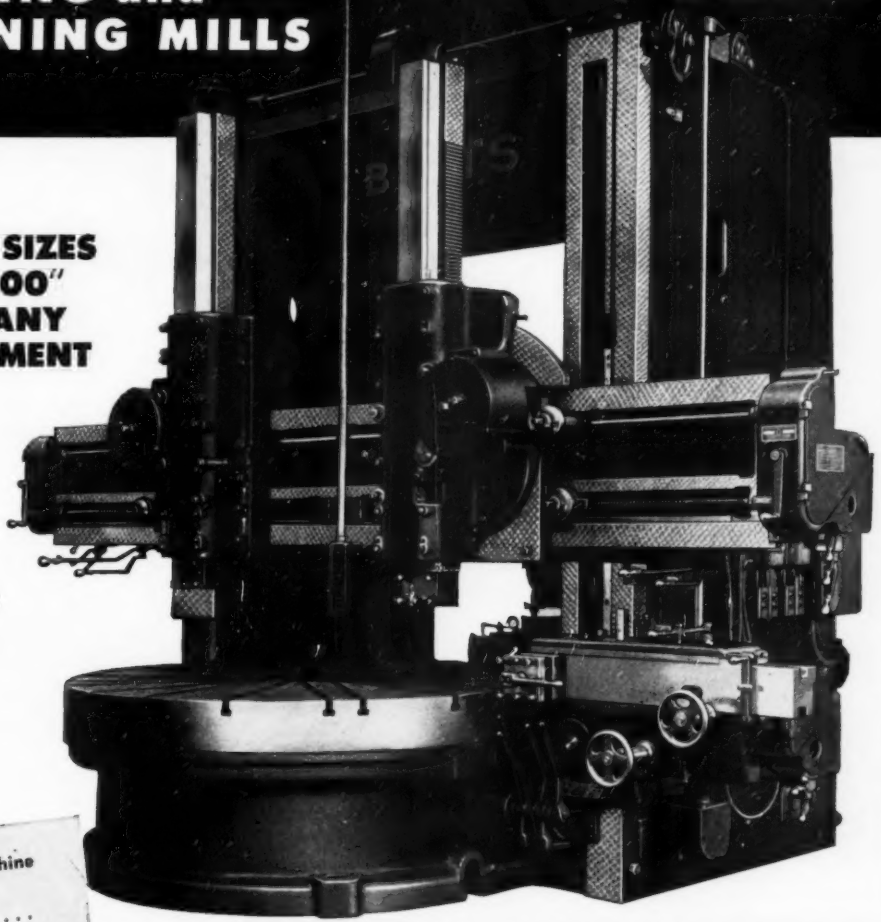
Bryant Chucking Grinder Co. • Springfield, Vermont, U.S.A.

BORING and TURNING MILLS

BETTS

BUILT IN SIZES FROM 100" UP TO ANY REQUIREMENT

For full details on 100" Mill send for Bulletin No. 2128



BETTS 100" HEAVY DUTY BORING AND TURNING MILL

As in other Betts Boring and Turning Mills, this 100" mill is designed to provide a rugged, simplified general purpose tool that successfully combines accuracy, speed and power. Its features, many of which are exclusive, all contribute to this machine's reputation for outstanding performance; its production speed and accuracy, long operating life, safety of operation, convenience of control and all-around dependability under exacting operating conditions.

Among Heavy Machine Tools built by Consolidated are . . . .

- LATHES
- BORING MILLS
- DRILL PRESSES
- MILLING MACHINES
- BORING MACHINES
- COLD SAW MACHINES
- BORING, DRILLING AND MILLING MACHINES
- DRILL AND TOOL GRINDERS
- PLANERS
- SLOTTERS
- RAILROAD SHOP TOOLS
- AUTOMOTIVE TOOLS
- AND OTHER SPECIAL MACHINES

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

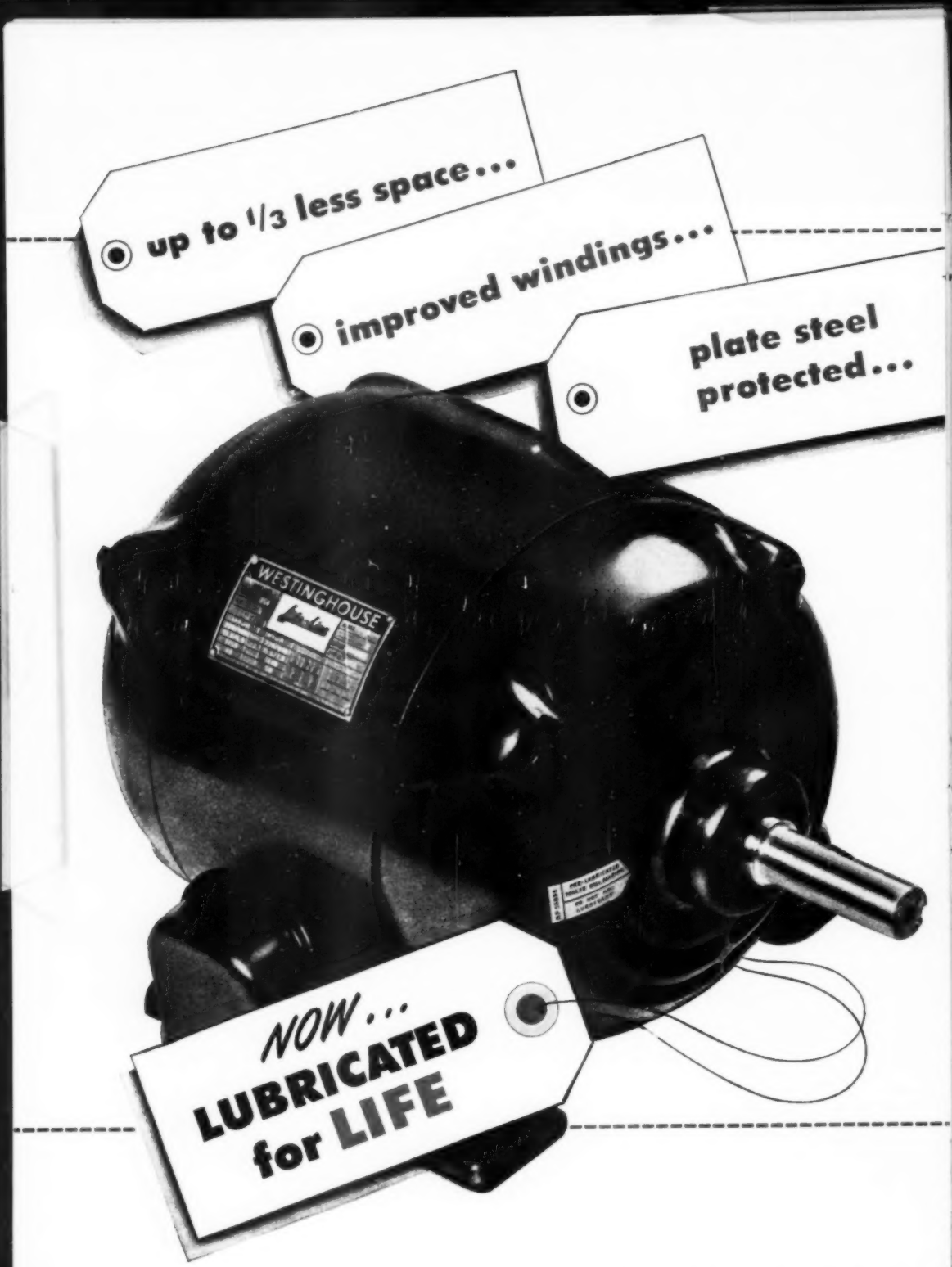
BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED

MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK


up to 1/3 less space...
improved windings...
plate steel protected...
WESTINGHOUSE
NOW...
LUBRICATED for LIFE

YOU CAN BE **SURE**.. IF IT'S

Westinghouse

—and NOW...

Lubricated for LIFE!

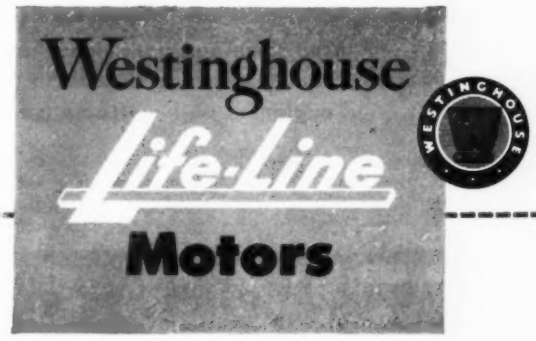
Now . . . for the first time . . . you can install electric motors, or motor-driven machines . . . and forget motor lubrication *for life!*

Westinghouse Life-Line . . . industry's amazing new, all-steel motor . . . now completely eliminates the biggest element in the maintenance of motors and motor-driven equipment . . . the need for periodic motor lubrication.

Eliminated, too, are two of the most frequent causes of motor burnouts and lost time . . . overgreasing and undergreasing of motors. Life-Line motors are equipped with sealed bearings, pre-lubricated for life with a more-than-ample supply of specially-treated lubricant.

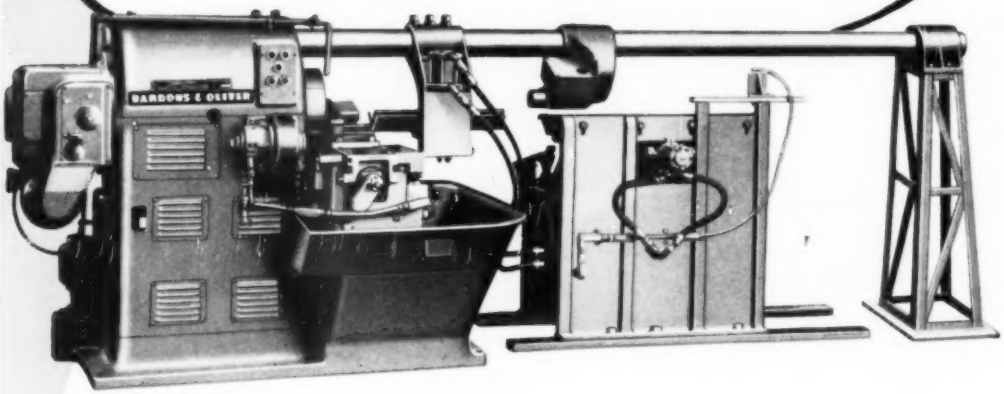
Correct lubrication and long life are assured ...machine outages are reduced...motor drive problems are simplified, since motors can be located without need for constant accessibility.

Added to Life-Line's outstanding advantages of plate-steel protection, improved windings and more compact size, *lifetime lubrication* is one more important reason for starting to convert, today, to Life-Line power. Standard ratings are available from stock—others on short delivery schedules. Ask your Westinghouse representative for price and delivery on your requirements, or write P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21495



The Bardons & Oliver No. 35 Hydralectric Cutting-Off Machine with *Automatic Unloading Table*

DELIVERS HIGH PRODUCTION ON PROPELLER SHAFT TUBES



Tubing ranging from 1½" to 5½" in diameter is cut off in lengths of 30" to 60" and automatically loaded on flat trucks. The stock is delivered to the roller feed by an automatic loading table, fed through the spindle and gripped by the hydraulic collet chuck. The two cutting off slides take equal cuts and work simultaneously. The automatically receding stock stop gages the length within close commercial tolerances. The entire operation of loading, cutting to length, ejecting and delivering to the truck is fully automatic.

The same automatic, labor saving principles can be applied to a large variety of cutting-off work. If yours is a kindred production problem, our engineers will welcome an opportunity to work out the solution.

Builders of a complete line of Ram and Saddle Type Turret Lathes, also Hydralectric, Hydraulic and Hand Operated Cutting-Off Machines.

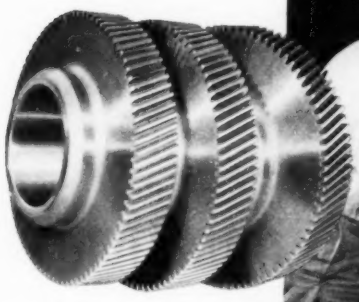
BARDONS & OLIVER, INC.

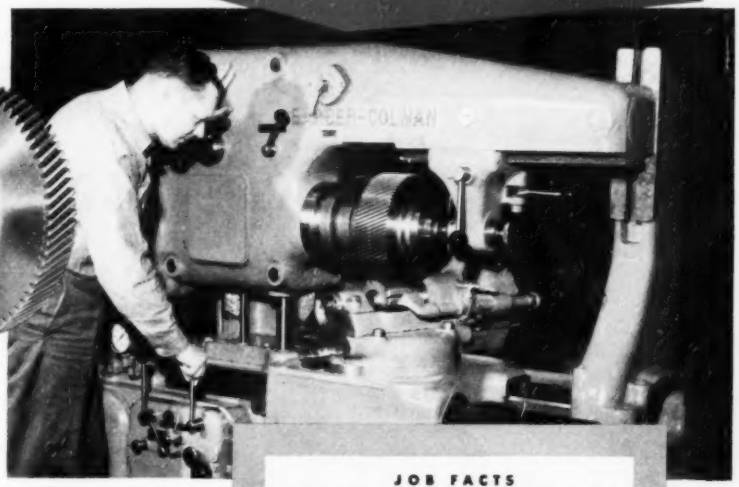
1133 WEST 9TH STREET • CLEVELAND 13, OHIO

ACCURACY · ECONOMY · LONG LIFE

Monarch TURNING MACHINES

CUTS HOBBING TIME FROM 33 TO 13 MINUTES PER GEAR





with the

BARBER-COLMAN

NO. 14-15

HOBBING MACHINE

Monarch Machine Tool Company has reduced hobbing time on these 8 pitch helical lathe gears by 61%, using the Barber-Colman No. 14-15 Hobbing Machine and ground Class A *"Multithread"* Hobs. Gears are climb-hobbed, leaving .015" stock for finishing and holding non-adjacent tooth spacing error within .001"-.002".

As a result of the installation of this No. 14-15, large diameter *"Multithread"* hobs are used at faster feeds, giving greater production. Better work finish is obtained and the overall job improvement has appreciably reduced the number of hobbing machines required for a given output. For stepped-up production with a maximum of accuracy and ease of operation, Barber-Colman

JOB FACTS

Operation — Climb hob 8 pitch Helical gears, 11-1/2" dia., 84 teeth
Material — NE 8749
Hobs — *"Multithreads"*, 8 pitch, 5-1/2" x 4" x taper bore
Feed — .060" per rev. of work
Speed — 90 SFM
Hobbing Time — 13 min. per gear
Accuracy — Non-adjacent spacing held within .001"-.002"

No. 14-15 Hobbing Machines offer automatic cycling with hydraulic movement and clamping. Results show better, faster output with less work and a minimum of non-productive machine time. Write our engineering department for estimates.

Barber-Colman Company

GENERAL OFFICES AND PLANT, 1111 LOOMIS ST., ROCKFORD, ILLINOIS, U. S. A.

METHODS ENGINEERS

This new release on the No. 14-15 Hobbing Machine contains typical examples of actual field performance. Write for copy of Bulletin No. 1111.

for trouble-free surface grinding under extra dusty or severe operating conditions . . .

The New 2L and 2LB Surface Grinding Machines with Built-in Protection

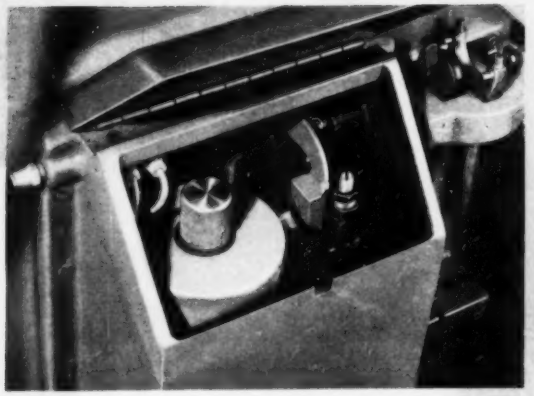
Here are two new Brown & Sharpe Surface Grinding Machines with two important, built-in features for positive protection against dust, grit and severe service conditions. In addition these machines have all the highly-productive features of the popular Nos. 2 and 2B machines.

The new machines Nos. 2L and 2LB have full automatic lubrication and strategically-placed dust guards. These features reduce maintenance costs and extend machine life . . . valuable production and investment-protection advantages.

Like the Nos. 2 and 2B, these machines are made for efficient surface grinding with precision and fine finish on small and medium-size work.

CAPACITY: Grinds work to 18" long, 6" wide and 9½" high, using a wheel 7" in diameter. No. 2L (illustrated) has automatic feeds; No. 2LB, hand feeds only.

BROWN &



AUTOMATIC LUBRICATION. Pump and filter are located in compartment on left side of machine.

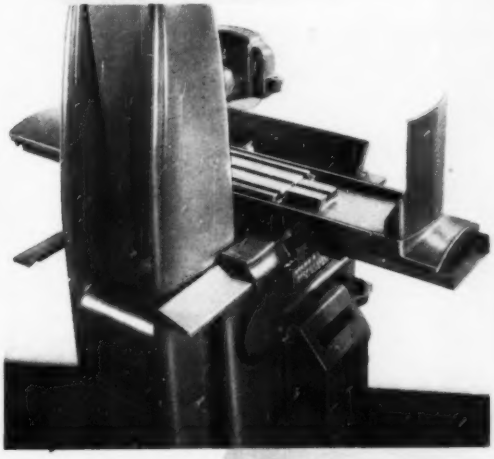
AUTOMATIC LUBRICATION !

Lubrication of the 2L and 2LB is never a chore or a worry. All moving parts and adjustable surfaces automatically lubricated by plunger pump from reservoir on left side of base. Convenient sight indicator on right side of upright shows operation of oiling system. Oil is filtered before being returned to reservoir.

DUST PROOFED !

Extra precaution has been taken to protect these machines from dust and dirt. Table ways are completely guarded. Saddle and upright ways are similarly protected. Elevating mechanism completely enclosed.

WRITE FOR DESCRIPTIVE BULLETIN . . . illustrating both the 2L (with power feeds) and the 2LB (with hand feeds only). Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

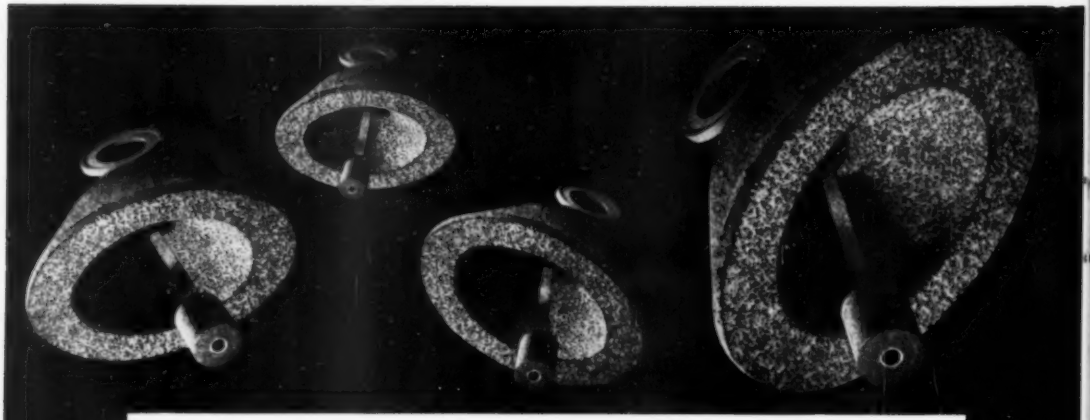


DUST PROOF COVER GUARDS. Table and saddle ways are fully protected against abrasive dust.

. . . TYPICAL PROVEN FEATURES INCLUDE

- Removable unit-type precision wheel spindle; plain or antifriction bearing type; interchangeable.
- Alternate choice of spindle drive; with motor in base; with motorized spindle.
- All controls and adjustments conveniently located. Electrical controls enclosed in separate housing.
- Versatile. Several money-saving attachments.

SHARPE B·S



Now! Peninsular announces custom-tailored vitrified wheels!

Peninsular announces the addition of vitrified bonded wheels to its present line of superior resinoid bonded wheels.

These vitrified wheels offer the same custom-tailored precision as the Peninsular resinoid line. They are available in a variety of sizes and shapes to meet most of your grinding needs. Continued expansion and development of the vitrified line will assure individualized engineering attention for many of your grinding operations.

This news may be the best of the year if you're glum because of high grinding expenses. Peninsular's new vitrified wheels and "tailored-for-the-job" service may be able to help you cut down dressing costs, give you longer wheel life and higher stock removal. *Why not call on Peninsular engineers to plot a new grinding course for you?*

They'll examine everything about your grinding operations—the machinery used, the materials ground, and the finishes required. After a complete study of their findings, Peninsular develops and recommends wheels specifically designed to fill your needs.

Peninsular has brought the good news of lower grinding costs to manufacturers in over fifty diversified fields.

Why not get good grinding news for yourself this year by calling on our Peninsular consultants?

The Peninsular Grinding Wheel Co., 729 Meldrum Ave., Detroit 7. Sales Offices: Chicago, Philadelphia, Buffalo, Cleveland, Pittsburgh, Houston, St. Louis, Cincinnati.

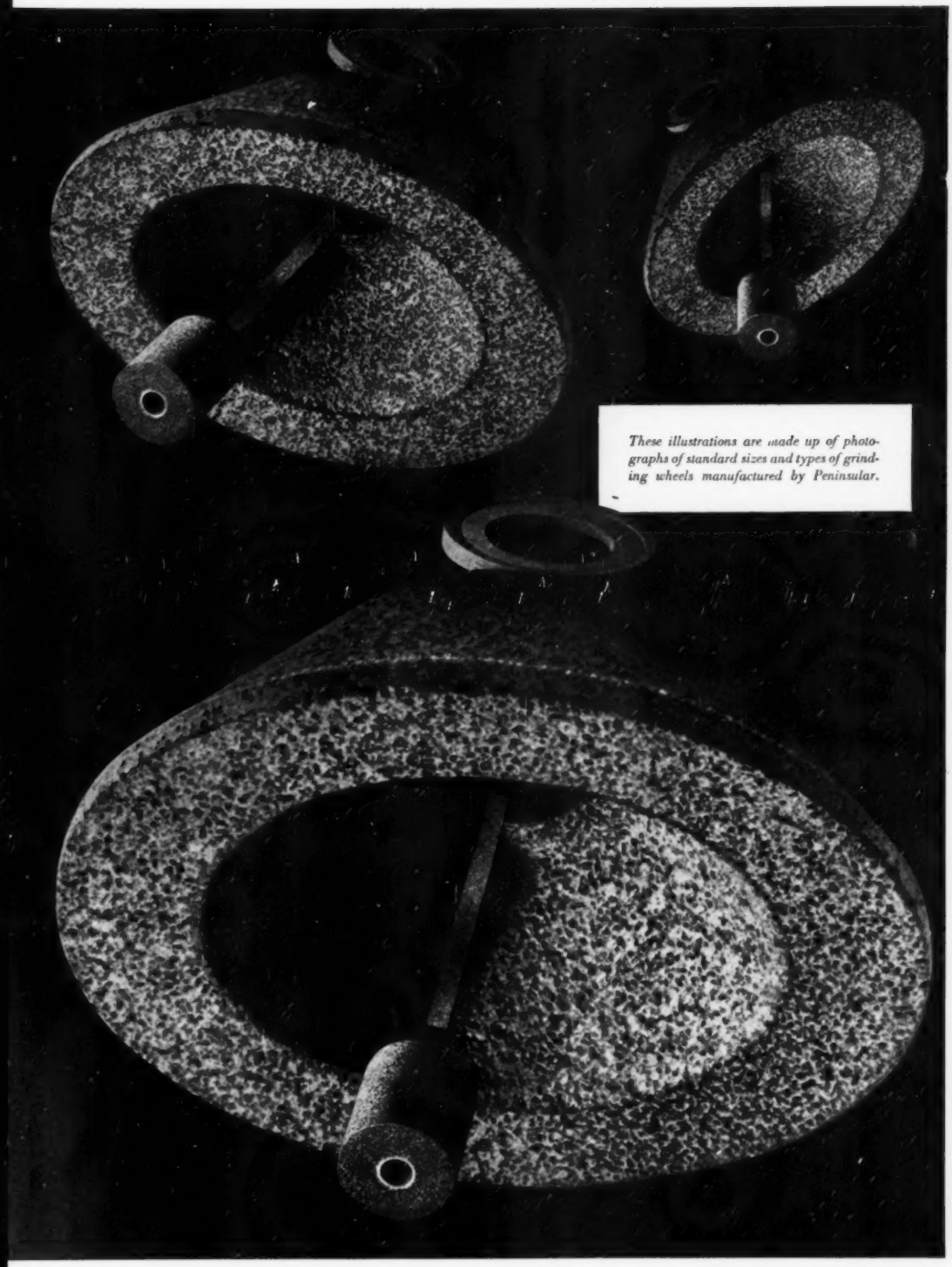
PENINSULAR

INDIVIDUALLY ENGINEERED

GRINDING WHEELS

SINCE 1889

SPECIALISTS IN RESINOID AND VITRIFIED BONDED WHEELS



These illustrations are made up of photographs of standard sizes and types of grinding wheels manufactured by Peninsular.

Want Speed—or

Sunnen Honing Gives You Both!

There's no end to the time and money saving jobs you can handle on versatile Sunnen Honing Machines wherever straight, round holes are desired. You can remove stock from internal diameters in a hurry — .001" a minute in hard steel, .005" a minute in soft steel, up to .020" per minute in bronze, brass, aluminum, cast iron, etc.

You can remove distortion caused by chucking or heat treating — correct bellmouth, "rainbow" and taper in holes.

In the competitive days ahead when you're going to have to build a better product and at the same time cut corners on costs, you can't afford to overlook the possibilities that Sunnen Honing offers you.

For example, you can . . .

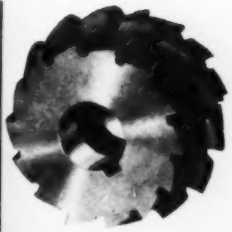
- **Save time, no chucking required**
- **Speed assembly of parts**
- **Maintain accurate alignment**
- **Eliminate selective fitting and assembly bottlenecks**
- **Reduce rejects which often interrupt flow of production**
- **Salvage valuable parts**
- **Remove cross-drill burrs or flash**
- **Hone all metals, ceramics, glass**

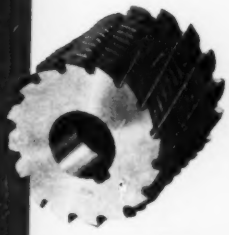
Get all the facts now — find out how Sunnen Honing will save time and money for you.

Write for Booklet **MB-5**

SUNNEN HONING
Assures Low Cost

Accuracy?





Another Typical Case History

"Switching from Lapping to Sunnen Honing Increased Production of Tools for Us"

—Barber-Colman Company, Rockford, Illinois

"Sunnen Honing has almost eliminated rejections of hobs and milling cutters; and we are working to tolerances of .0002". Costs were cut; and surface finish has been improved. True geometric accuracy permits holding standard sizes easily."

Tools shown at right have bores ranging from ¼" to 1½" in diameter, from ¼" to 4" in length. Material is hardened steel, Rockwell 65-"C."

SUNNEN PRODUCTS COMPANY

7939 Manchester Avenue, St. Louis 17, Missouri

Canadian Factory: Chatham, Ontario

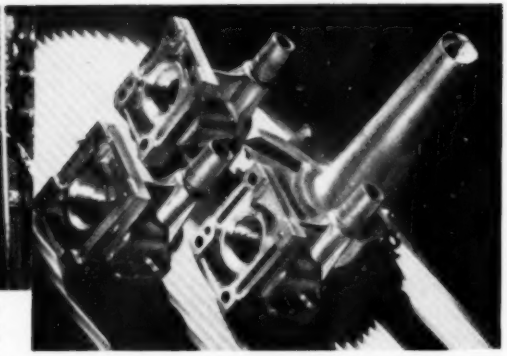
408

Production of Accurate Holes

If you're considering new die casting machinery...

why not profit from the experience of others?

One of a battery of 5 Model 400 Clevelands in operation in the modern plant of the St. Louis Die Casting Corp., St. Louis, Mo. The operator is removing the casting shown at right.



ST. LOUIS DIE CASTING CORP. *gets better castings, faster, at less cost* WITH CLEVELAND MODEL 400's

These three examples are typical of the production —*around the clock*—that experienced die casters are getting from Cleveland Die Casting Machines. You too can get better castings, faster, at less cost, with Clevelands.

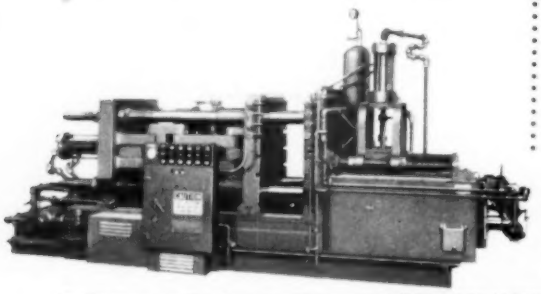
Let a Cleveland engineer show you *further proof* of the advantages these machines can bring to your die casting production. For complete information on machine specifications, write now for bulletins.

340 SHOTS PER HOUR!
Weight of metal per shot 14.35 oz. Weight per piece 4.6 oz.

Zinc fan gear case casting from two-cavity die with movable cores. Most of the cored holes required no further finishing. Three critical dimensions are held to ± .001" tolerance. Each casting receives a careful spot check, and at time photo was taken, 170,000 castings had been produced without a single reject.

325 SHOTS PER HOUR!
Weight of metal per shot 3.3 lbs. Weight per piece 4.75 oz. Zinc nuts cast from 8-cavity die.

375 SHOTS PER HOUR!
Weight of metal per shot 1.15 lbs. Weight per piece 1.8 oz. Zinc nobs for electric control panel cast from 6-cavity die.



Cleveland Model 400 Universal High-Pressure Hydraulic Die Casting Machine for zinc, tin or lead. Hot metal end can be easily changed to convert to cold chamber machine. 36" x 38" die plates. Approx. 800,000 lbs. locking pressure.

THE CLEVELAND AUTOMATIC MACHINE COMPANY

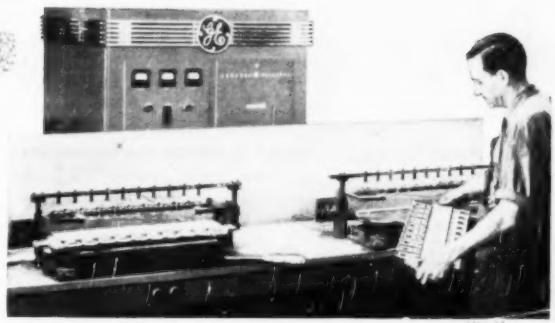
4928 Beech Street
Cincinnati 12, Ohio

SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
HARTFORD • NEWARK

Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

ELECTRONIC HEATERS ON THE JOB: SILVER-BRAZING STEEL

fewer rejects lower unit cost production increased: 1600%



INCREASED PRODUCTION of instrument panel trim is a fact at Croname, Inc. Thanks to their G-E induction heater, production of panel assemblies has been boosted from *500 a day to 8,000 a day.*

A two-station work table, which permits studs to be brazed to panels in groups of 10 assemblies, makes it possible for Croname to use their G-E induction heater to full advantage. Two assistants keep the operator supplied with prepared loading boards. The operator in turn loads and unloads one station while heat is being applied at the other.

Net result: a tremendous boost in production of more uniform assemblies with fewer rejects—thanks to induction heating.

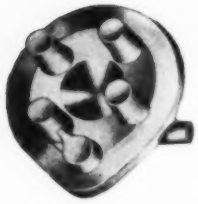
Electronic INDUCTION HEATERS

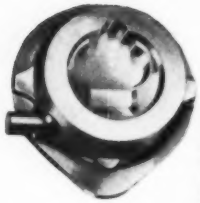
YOUR PRODUCT AND INDUCTION HEATING

If your production involves brazing, soldering, hardening, or annealing, be sure to get in touch with the Heating Specialist in the nearest G-E Office. His suggestions are very likely to result in higher production, lower cost and better products, as they have for so many other manufacturers. In the meantime, send for free bulletin GES-3290, "The How and What of Electronic Induction Heating." ***Sect. 675-187, Apparatus Department, General Electric Company, Schenectady 5, N. Y.***

GENERAL ELECTRIC

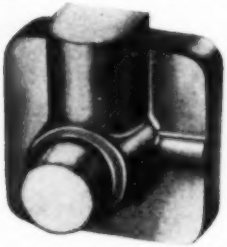
675-187





BRASS FORGINGS

are the answer where non-corroding, non-porous materials of great strength are essential



BRASS FORGINGS ARE SUPERIOR IN MANY WAYS TO SAND CASTINGS

LOWER COST: The combination of smoother surfaces, absence of porosity, better machinability, longer tool life, less chucking difficulty, closer tolerances, fewer operations, lighter weight, and practically no scrap, results in the production of a superior product at a lower cost.

Forgings possess about twice the tensile strength of sand castings. Extreme pressures under which the forgings are produced, once during extrusion and again during forging, assures a dense, close-grained material.

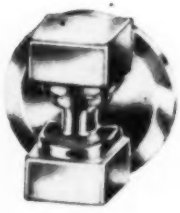
Due to the absence of scale, sand, etc. in the metal, forgings can be machined at a higher rate of speed than similar parts made by other processes, and the smoothness of surface, combined with close tolerances, frequently eliminates machining operations. The life of machine tools is greatly increased.

COMPARISON OF COST OF AVERAGE BRASS FORGINGS AND BRASS CASTINGS

(Quoted Figures are approximate)

Machined — Ready to polish, buff and plate	FORGINGS COST 20% LESS	
Polish and Buff	FORGINGS COST 50% LESS	
Scrap after Polishing and Buffing	CASTINGS 7%	FORGINGS 0

The Mueller Brass Co. is equipped to forge, completely machine, polish, buff, lacquer or plate. Let us quote you on your product in Forged Brass.



MUELLER BRASS CO.

PORT HURON, MICHIGAN

added production...without adding brick and mortar

When a comptroller talks about investment cost necessary to increase the production of machined parts, maybe he is figuring in the cost of increased floor space, too.

Of course, *you* know that Acme-Gridley Automatics often double the production of an ordinary machine without taking up any more space. But it might help to remind him that the new Acme-Gridley Automatics may make even *more* floor space available in your present plant—that it is not unusual for one new Acme-Gridley to replace two or even four older machines.

Perhaps you will want to have some facts and figures to back up your story. Below is a typical certified case study. Would more of these—on 4, 6 or 8 spindle Chucking Automatics—help you? They're yours for the asking

CUT THIS OUT FOR USE WHEN YOUR COMPTROLLER WANTS PROOF

AN ACME-GRIDLEY CERTIFIED CASE STUDY

THIS IS WHAT HAPPENED:

MACHINE—Acme-Gridley 12″ RPA 6 Spindle Chucker

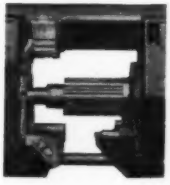
PART—6½″ Diameter Heat-Treated Malleable Casting

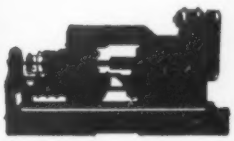
MACHINING TIME—For 18 operations, with tipped tools —one fifth of former method

Two Acme-Gridley 12″ RPA 6 Spindle Chuckers now complete this part in one handling, doing the work of 20 obsolete machines they replaced—*and reducing cost per piece by more than 70%.*

AND HERE'S ONE IMPORTANT REASON:

A wide, open tooling zone is characteristic of the Acme-Gridley design. There's plenty of space for time-saving, moneysaving, independently-operated attachments that often save second operations. And more room means easier tooling, easier loading, faster chip disposal. All these are important reasons for faster floor-to-floor times on Acme-Gridley chuckers.





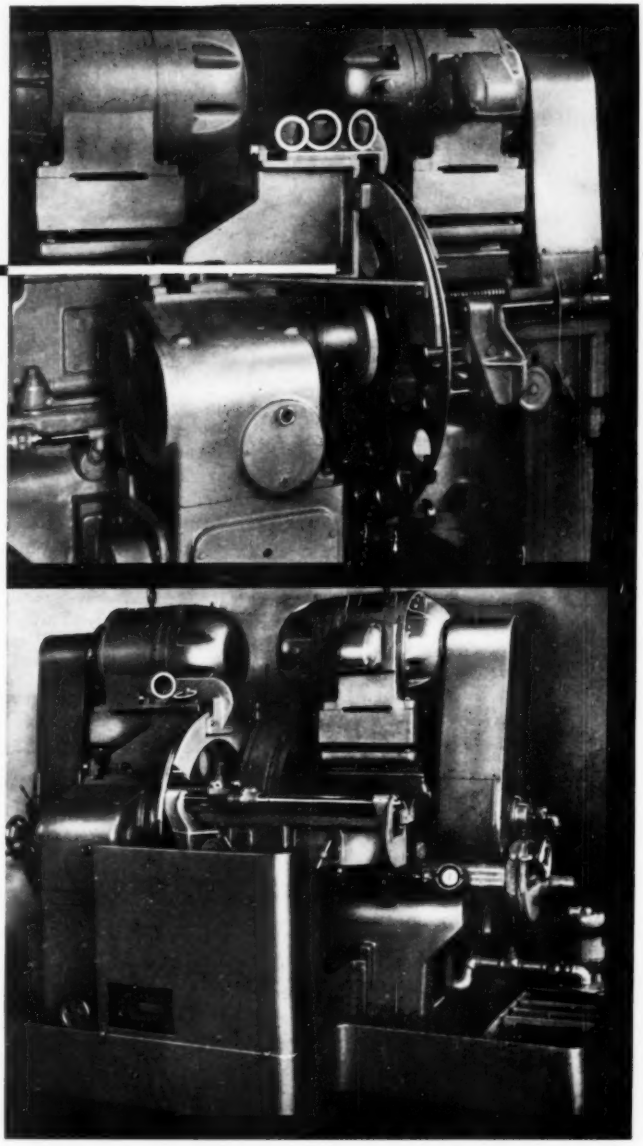
ACME-GRIDLEY BAR and CHUCKING AUTOMATICS built in 4, 6 and 8 spindle styles, maintain accuracy at the highest spindle speeds and fastest feeds modern cutting tools can withstand.

THE NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

Cut Your Parallel-Surfacing COSTS

RIGHT IN HALF - *like this* with GARDNER *Double* GRINDING



YOU get more productivity per man-and-machine-hour — more than DOUBLE, in many cases — by grinding TWO surfaces with ONE pass. The parts flow smoothly between two opposed grinding wheels — as fast as they can be fed into and ejected from the machine. Here is a typical example:

WORK DATA

Part *Gears 3.165" O.D. x 1.261" I.D. x .495" Thick*
Material *Steel*
Operation *Grind Two Sides*
Tolerances *.001" for Parallel; .004" to .005" for Uniformity*
Stock Removal *.015" Maximum Overall*
Production *18 to 20 Pieces per Minute*
Feed *Hand Load to Trough; Automatic Unload*
Machine *#125-26" Gardner Grinder With Rotary Work Carrier*

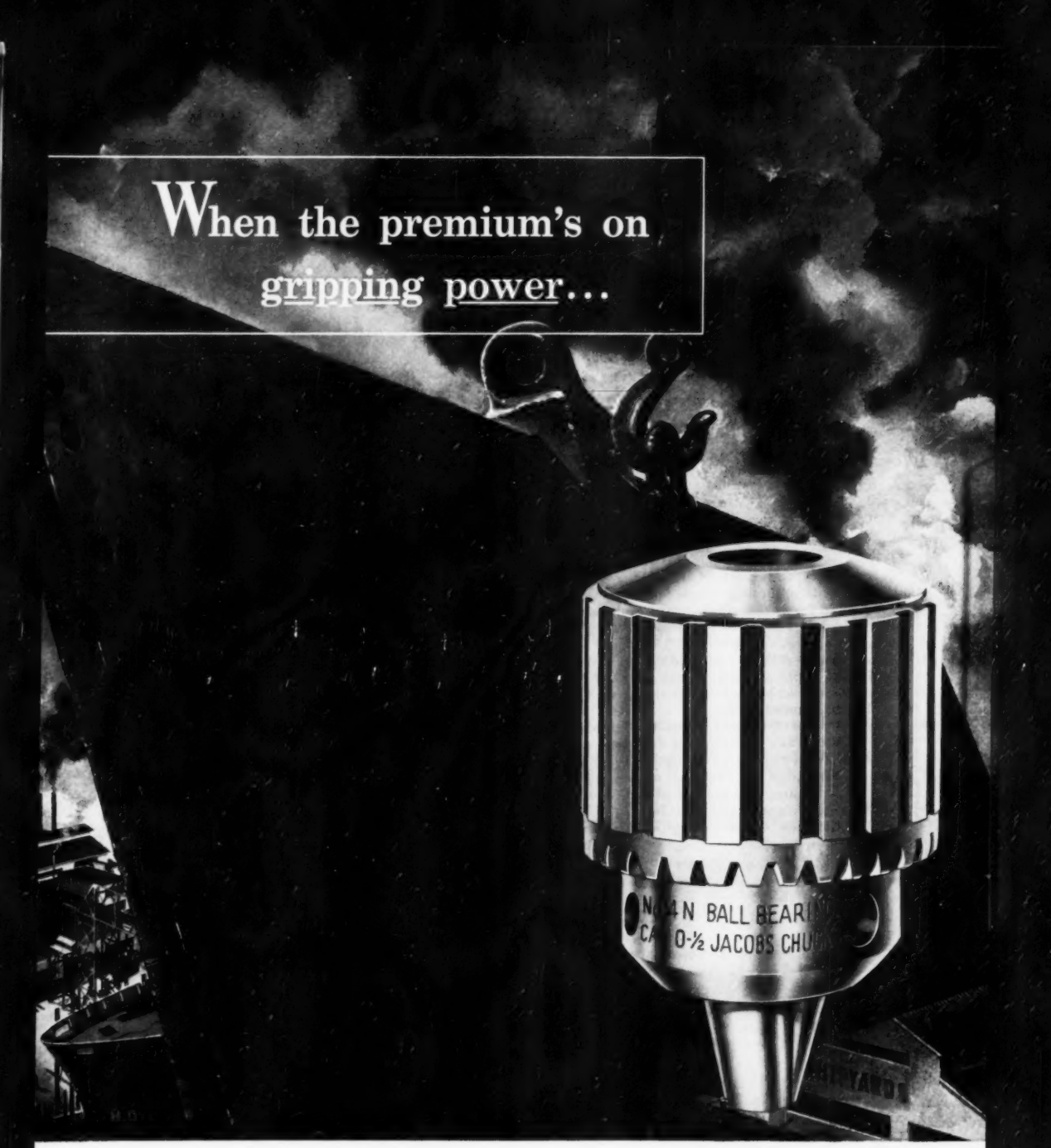
Cut your high labor and material costs by halving your parallel-surfacing operations — on a GARDNER *Double* GRINDER!

Write for Bulletin on Gardner Double Grinding

GARDNER - GRIND YOUR *Flat* SURFACES

GARDNER MACHINE COMPANY

410 East Gardner Street • • • • Beloit, Wisconsin, U.S.A.



Jacobs Ball Bearing Super Chucks hold tools with the tightest practical grip ever devised. You will find their tremendous gripping power is in a class by itself. So friction-free you can tighten them by hand alone and equal the grip of any other key-operated chuck. Ball Bearing Super Chucks are stocked by your Industrial Supply Distributor The Jacobs Manufacturing Company, Hartford 2, Connecticut.

FOREMOST IN CHUCKS · FIRMEST IN GRIP ·

If it's a JACOBS, it holds

Jacobs Chucks

GEAR PRODUCTION HIGHLIGHTS

No. 102

Cutting-Shaving-Checking-Lapping

MICHIGAN TOOL COMPANY
7171 E. McNICHOLS RD. • DETROIT 12, MICH.

Form-Tools Cut Machine Time On Pump Gears 90%, Improve Precision

Gar Wood Industries, Inc., Wayne, Michigan, is currently producing all five of its major hydraulic pump gear types on a single Michigan Shear-Speed, followed by shaving on a Michigan rotary gear finisher. This setup has the following advantages:

1. **Sharply reduces cutting time (only 93 seconds for gear "E" against 18 minutes for hobbing).**
2. **Tooth spacing, so important and relatively difficult to maintain in pump gears, is automatically maintained by the multiple form tools of the Shear-Speed, even on the coarsest pitch gears having a minimum of overlap.**
3. **Distortion and difficulty in holding the work is eliminated since cutting pressures are completely balanced by cutting all teeth simultaneously, with radial feed.**
4. **Accuracy of tooth form is easily maintained since this depends primarily on the accuracy to which the form tools were ground initially.**
5. **Output per grind of tools is approximately doubled, reducing the number of tool changes during a given production run. Design of tools permits between 40 and 50 grinds, removing .015 each time.**

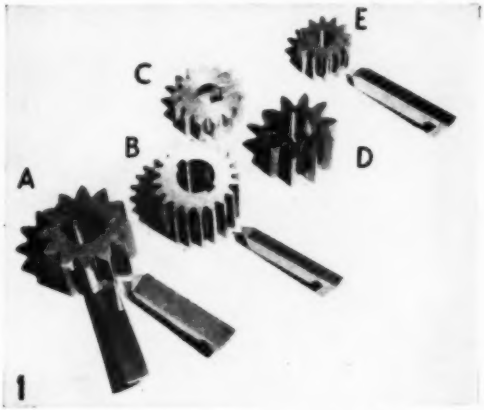
Fig. 1 shows the 5 types of pump gears (for specifications, see table below). Gear "A" is produced in two cuts, the roughing and finishing tools shown being interchangeable in the same cutter head. Gears "D" and "C" are also cut in two steps. However, two "C" gears are cut at one time with the blanks stacked one above the other. Metal removal on "C" and "D" is almost one-half of total blank weight.

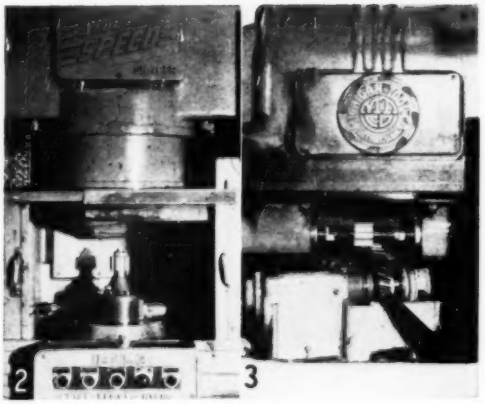
Fig. 4 shows the cutter head, finished gear and blank for gear "E." The Shear-Speed is shown in Fig. 2, with one of the three gear shavers in Fig. 3.

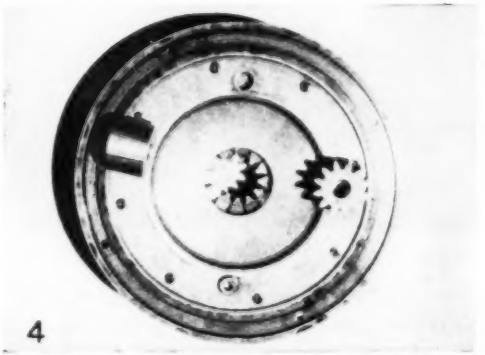
Pump outputs range from 13½ to 52 gpm at 800 psi and 1000 rpm for these gears. Finished gears are so accurate that the 13½ gpm pump will actually deliver up to 17 gpm at 1000 psi and 1000 rpm.

Gear (See Fig. 1)	No. of Teeth	Outside Dia.	Face Width	Diametral Pitch	Pressure Angle	Pump Use	No. of Operations
A	12	3.645	2¾	3.8052	35°	Road Mach.	2
B	20	3.487	2¾	6.342	20°	Road Mach.	1
C	14	3.192	1¼	5.000	22½°	Hoist	2*
D	10	3.195	2¼	3.8052	27½°	Loadpacker	2
E	12	2.332	1⅛	6.000	22½°	Hoist	1

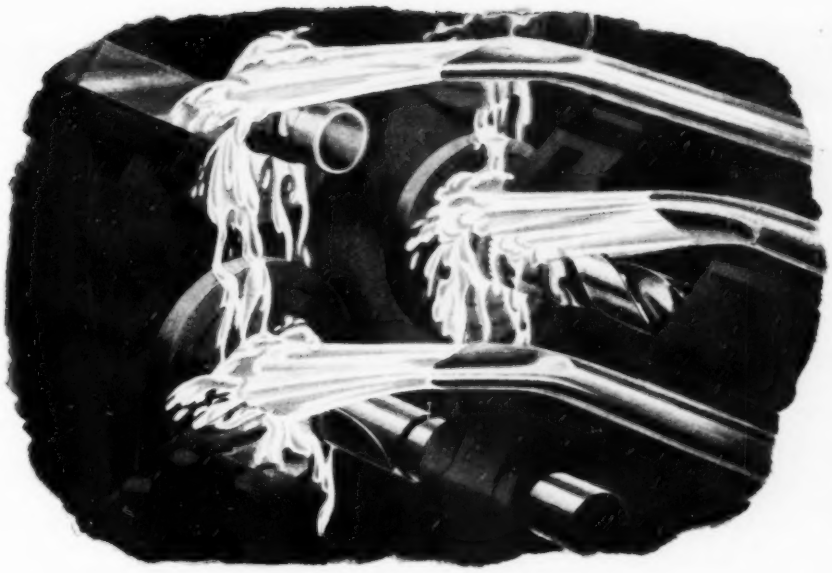
*—Two gears cut at one time, however.







For Shear-Speed machine details, write Michigan Tool Company for Bulletin SS-48-2.



CHIP CONTROL IN MACHINING ALCOA ALUMINUM

Your chip problem varies with the alloy you use. For example, 11S-T3 machines fastest, breaks into small chips. 17S-T4 and 24S-T4 produce tougher chips that require simple practices in tooling and setup to clear the chips.

In the free booklet, "Alcoa Aluminum in Automatic Screw Machines", you'll find detailed explanations of the procedures shown here. Ask your nearby Alcoa sales office for a copy. This helpful literature and Alcoa's extensive knowledge of aluminum are always at your disposal. ALUMINUM COMPANY OF AMERICA, 1709 Gulf Building, Pittsburgh 19, Pennsylvania.

CHIP GROOVES AND RAKE ANGLES—Small rake angles for 11S-T3 give small chips. Larger rake angles should be used for the other alloys for freer cutting. Chip grooves may be ground in some tools with a pencil wheel or the corner of a larger grinding wheel to increase the rake and curl the chip away from the tool and work. Under some conditions, the chips from 17S-T4 and 24S-T4 may be broken into small pieces.

COOLANT—Use a large volume of cutting fluid to wash away chips and cool tools and work. Thin, high-speed streams won't do the job. Direct the coolant to wash away chips from tools and work.

DRILLS—Drill flutes should be large and polished to pass out chips freely. In deep hole drilling, use several drills or back out drill to clear chips. Low feeds produce more chips.

GOOD MACHINING PRACTICES SAVE METAL

ALCOA FIRST IN ALUMINUM

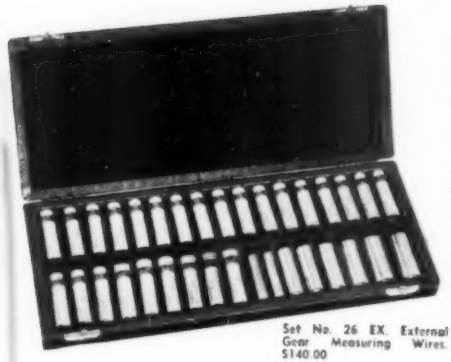
ALCOA ALUMINUM

ACCURACY *the* EASY WAY...

with the

Van Keuren >>>> GEAR MEASURING SYSTEM

Spurs, Helicals, Splines, Serrations



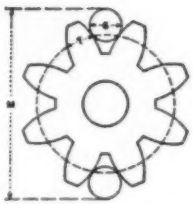
Set No. 26 EX. External Gear Measuring Wires. $140.00

THE Van Keuren Gear Measuring System is generally accepted as the easiest and most accurate method of checking tooth thickness of gears, 30° involute splines and 90° involute serrations. A measurement is made over two opposing wires and this actual measurement is compared with the theoretical measurement over wires for a perfect gear as computed from the Van Keuren tables for 1 diametral pitch gears.

The only equipment required is a set of 2 wires of the proper size for each diametral pitch.

Standard sizes of wires available from stock are:—

1.728" / DP	for external spurs and helicals
1.44" / DP	for internal spurs and splines
1.92" / DP	for enlarged pinions, 30° involute splines and 90° involute serrations.
1.68" / DP	Alternate series for special requirements.

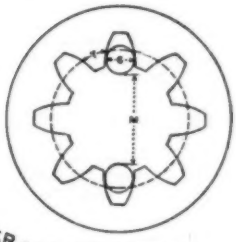


EXTERNAL SPUR GEAR

SIMPLE... For spur gears, involute splines and serrations, the only calculation is one of simple division. For helical gears use the simplified computation forms VK-103, VK-104 or VK-105.

RELIABLE... The 1.728"/DP System is used by over 90% of American gear producers and users. The 1.44"/DP and 1.92"/DP systems have been incorporated in standards for involute splines and serrations.

ACCURATE... The Van Keuren Gear Tables are complete for gears from 5 to 500 teeth and for pressure angles of 14½°, 17½°, 20°, 25° and 30°. If the measurement over the wires is greater than the value calculated from the tables, the tooth is too thick and the cutter must be fed further into the gear blank. Constants for controlling tooth thickness and backlash to .0001" are given for all pressure angles.



INTERNAL SPUR GEAR

MEMBER OF AGMA

This 208 page volume represents 2 years of research sponsored by the Van Keuren Co.

It presents for the first time in history a simple and exact method of measuring screws and worms with wires.

It tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods.

Copies now free upon request.

THE *Van Keuren* CO., 173 WALTHAM STREET, WATERTOWN, MASS.

30th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carbaloy Plug Gages • Carbaloy Measuring Wires

Everything Under CONTROL

The CONE Frame Design centralizes cam control outside of the tooling area, clear of chips. All cams, *visibly* accessible, have a stabilized high-point and are jig drilled. Change is easily made by removing a few screws.

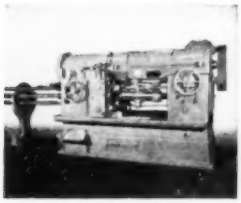
There is no satisfactory substitute to date for a good cam system, but the relative importance of its features should not be confused. Those that control and transfer smooth, positive power, to tool slides and other machine units, are of major importance. A feature of cam change facility, though useful, is less important.

Long runs, or "grouped" short runs, require minimum cam change, and the time for changing cams on any "automatic" is only a fraction of the total required for complete job change-over. A mere turn of a dial changes the working stroke of any slide on the 1" CONOMATIC, but this facility is of minor importance compared to the major advantages of the machine's CONE Cam System.

Any good investment has certain qualifications that prove it profitable. The wise investor and smart banker have some sort of measuring stick to analyze every investment they make. Why not use a chart to guide your purchases of Automatic Bar Machines? If you are already using a chart, perhaps you would like to compare it with the one that we have prepared. Write to us for a copy or ask your Cone representative.

	MACHINE #1*	MACHINE #2	MACHINE #3	MACHINE #4	MACHINE #5
WORK & TOOL CAPACITY	✓				
WORK & TOOL SUPPORT	✓				
WORK & TOOL MAINTENANCE	✓				

*CONOMATIC



A comparison with ALL Automatics will lead you to

Conomatic

#5

CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

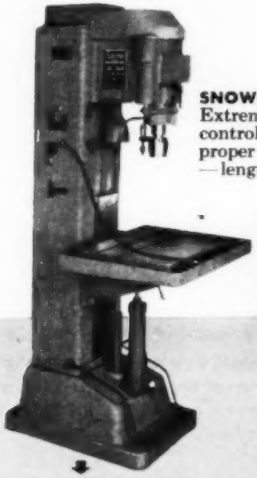
SNOW

FULL UNIVERSAL MACHINES

PRODUCTION OF SMALL PARTS OFTEN TRIPLED

Tomorrow's profits must come from lower costs. "Push Button" machine tools are imperative in today's competition. Snow Drilling, Tapping and Threading Machines are establishing amazing records daily. For faster production at lower cost Snow Machines are unsurpassed–versatile–economical.

AIR-OPERATED, ELECTRICALLY CONTROLLED DRILLING, TAPPING AND THREADING MACHINES



SNOW DRILLING MACHINE— Extremely sensitive pressure control allows drill to establish proper feed—cuts drilling time —lengthens tool life.

SNOW THREADING MACHINE — Produces accurate threads true to lead and thread form. Standard master fixtures minimize handling time.

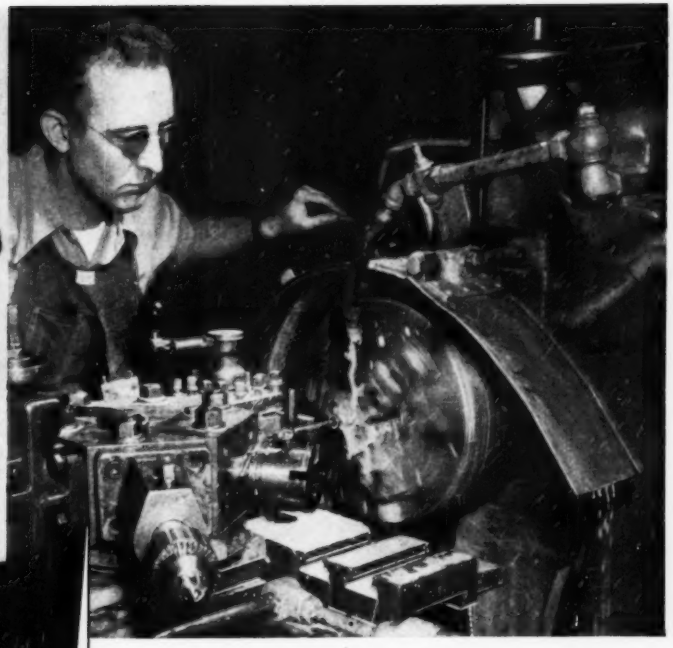
SNOW TAPPING MACHINE — Typical of advanced design and performance is the Snow Full Universal Tapping Machine. Electrical controls allow selection of operation method. Extreme sensitivity to power application prevents tap breakage. Class 3 and 4 fits and production up to 5000 parts per hour are possible. 4 sizes cover range from #0 to ¾" in mild steel.

Snow

HIGH PRODUCTION DRILLING, TAPPING, THREADING, NUT TAPPING, 2 SPINDLE, HORIZONTAL MACHINES, DRILL PRESS TAP HEADS, JIGS AND FIXTURES

SNOW MANUFACTURING COMPANY 439 EASTERN AVE., BELLWOOD, ILL. (SUBURB OF CHICAGO)

Standard Tooling Setup for the Warner & Swasey No. 4 Turret Lathe used in the Morse Chain Company tool room.



Morse Chain Company uses No. 3, 1-A, 2-A, 3-A and 4-A Warner & Swasey Turret Lathes for a wide variety of small lot work. Shown above is a No. 4 Universal for tool room production.

★ ★ ★

The parts made in the tool room vary from mild to toughest steel alloy. They are typical small lot jobs, machined profitably on a Warner & Swasey Turret Lathe.

MORSE CHAIN CO. PROVES TURRET LATHE *pays* IN THE TOOL ROOM

SMALL LOT JOBS are a problem of tool rooms everywhere. At Morse Chain Co., a division of Borg-Warner Corporation, Ithaca, New York, the tool room is requisitioned for jobs ranging anywhere from 1 to 20 pieces per lot.

Morse Chain equipped their tool room with a Warner & Swasey No. 4 Universal Turret Lathe, set up with Standard Tooling.

This high production machine soon proved it could be used profitably on small lot work. Setup time was reduced. Tool changes were unnecessary for many jobs. The machine had the power to take heavier cuts, — the rigidity to hold extreme accuracy. It permitted a range of feeds and speeds that got the work out faster.

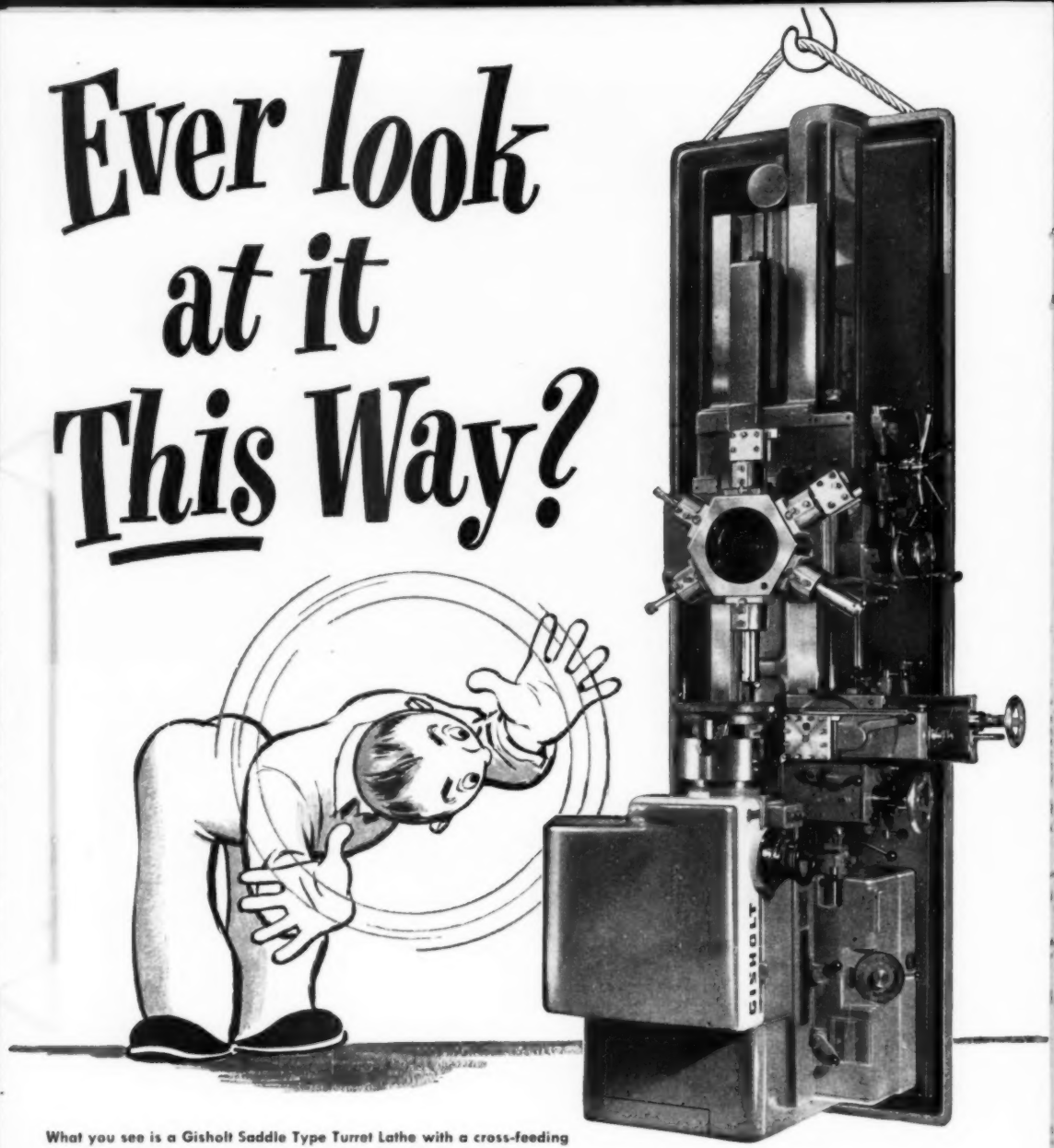
It might pay you well to find out what a Warner & Swasey Turret Lathe can do for you on small lot work in your shop or tool room. Call your nearest Warner & Swasey representative or write—

You can machine it Better, Faster, for less... with a Warner & Swasey

WARNER & SWASEY Machine Tools *Cleveland*

TURRET LATHES, MULTIPLE & SINGLE SPINDLE AUTOMATICS, PRECISION TAPPING AND THREADING MACHINES

Ever look at it This Way?



What you see is a Gisholt Saddle Type Turret Lathe with a cross-feeding turret and set on end to look like a Side Head Vertical Boring Mill.

This Turret Lathe is ideal for varied work on small lots. The cross-feeding hexagon turret will bore, face, recess, thread or otherwise finish the interior of the workpiece. The square turret on the side carriage will meanwhile face, turn or chamfer the OD. When necessary, you can pilot the hexagon turret tools or make other use of the hollow spindle. And all this is done with simple, inexpensive, easily set up tools.

Investigate the five basic sizes of the Gisholt Saddle Type Turret Lathe. Each is available with the money-saving cross-feeding turret.

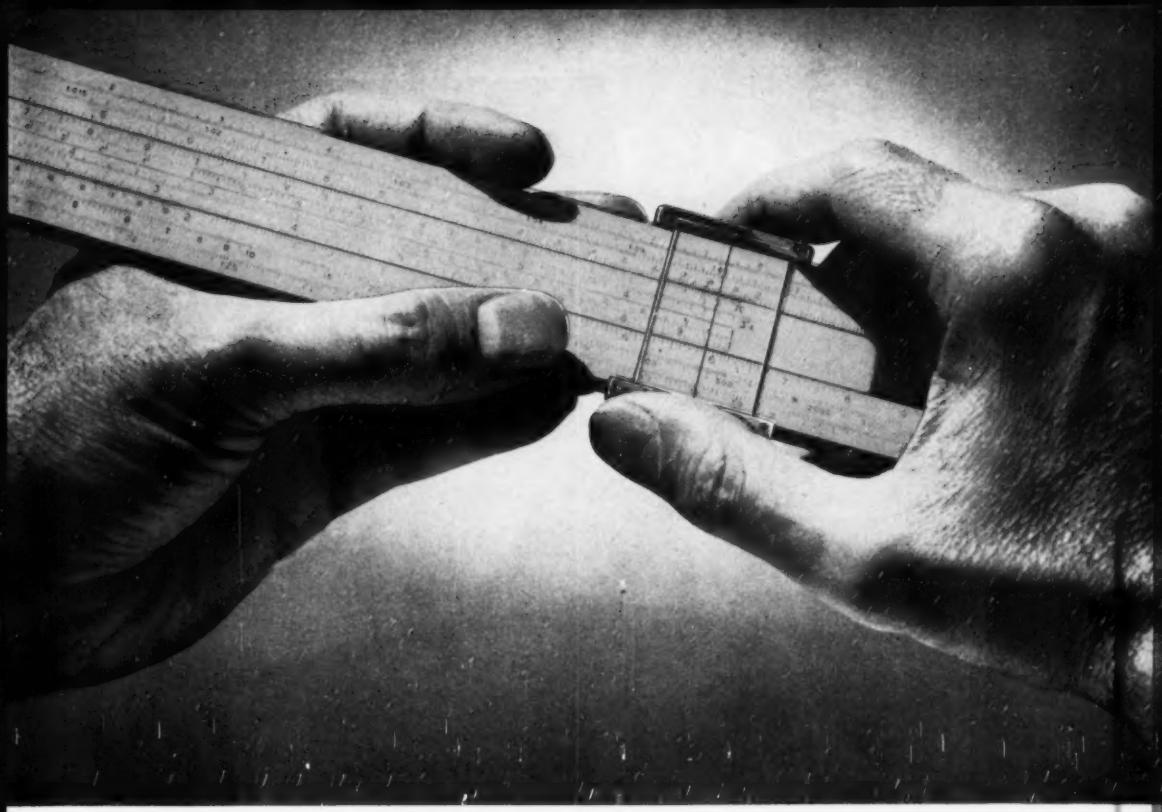
THE GISHOLT ROUND TABLE

represents the collective experience of specialists in machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES



Easy to figure how CIMCOOL° lowers metal cutting costs . . .

Cost figures show it in plant after plant. Cimcool—the revolutionary cutting fluid—this *chemical emulsion*—saves money three important ways:

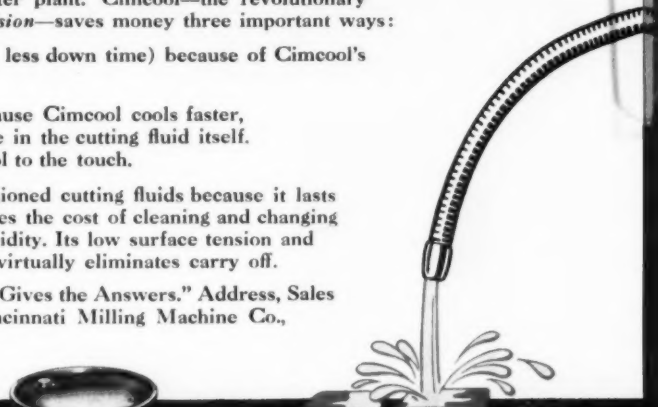
1. Longer Tool Life (and therefore less down time) because of Cimcool's *chemical lubricity.*

2. Faster Speeds are possible because Cimcool cools faster, through a unique physical change in the cutting fluid itself. Tools and chips actually stay cool to the touch.

3. Cimcool Costs Less than old-fashioned cutting fluids because it lasts longer in the machine and reduces the cost of cleaning and changing machines. It isn't subject to rancidity. Its low surface tension and low adhesion to work and chips virtually eliminates carry off.

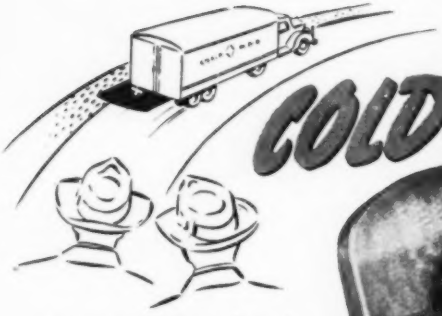
Write for free booklet, "Cimcool Gives the Answers." Address, Sales Manager, Cimcool Division, Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

°Trade Mark Reg. U. S. Pat. Off.



A Production-Proved Product of
THE CINCINNATI MILLING MACHINE CO.

for 85%
OF ALL METAL CUTTING JOBS



COLD RIVETED

no question about *Strength!*

YOU know the joint is tight...strong ...SAFE!—when it's COLD RIVETED with a Hannifin *"HY-POWER"* Hydraulic Riveter. Doubts about the effects of vibration, stress fatigue, and embrittlement vanish. Anyone, with little or no experience, can turn out perfect work hour after hour at high rates of production with effortless ease. Faulty workmanship ceases to be a hazard. Let Hannifin help you use this efficient, modern, low cost production method. Recommendations on request.

Right—Cold riveting main members of frame for giant truck trailer in plant of one of America's leading manufacturers.

HANNIFIN *Hy-Power* RIVETERS

Hannifin "HY-POWER" Hydraulic Pressure Generator

LAWN MOWERS TO CAR FRAMES.—Whether you are riveting lawn mower blades or railroad car frames, there is a unit to handle your job better, faster, and cheaper. The Hannifin line is complete. Standard portable yoke riveters from 7½ to 100 tons, or more.

PORTABLE, BALANCED!—Perfectly balanced, easy-moving yokes. Compact, portable, *"HY-POWER"* pressure generators. Simple connections. Units furnished complete. READY TO GO TO WORK.

NOISELESS "HYDRAULIC SQUEEZE" ACTION.—Smooth, fast, precision-controlled power at your finger tip—thanks to Hannifin's *exclusive "HY-POWER"* pressure generator design. No complicated electrical circuits; no relays. All-mechanical positive action. Simple pressure adjustments. SEND FOR COMPLETE INFORMATION.

HANNIFIN CORPORATION

1101 S. Kilbourn Avenue **Chicago 24, Illinois**

AIR CYLINDERS • HYDRAULIC CYLINDERS • HYDRAULIC PRESSES
PNEUMATIC PRESSES • HYDRAULIC RIVETERS • AIR CONTROL VALVES

Nationwide Sales and Service

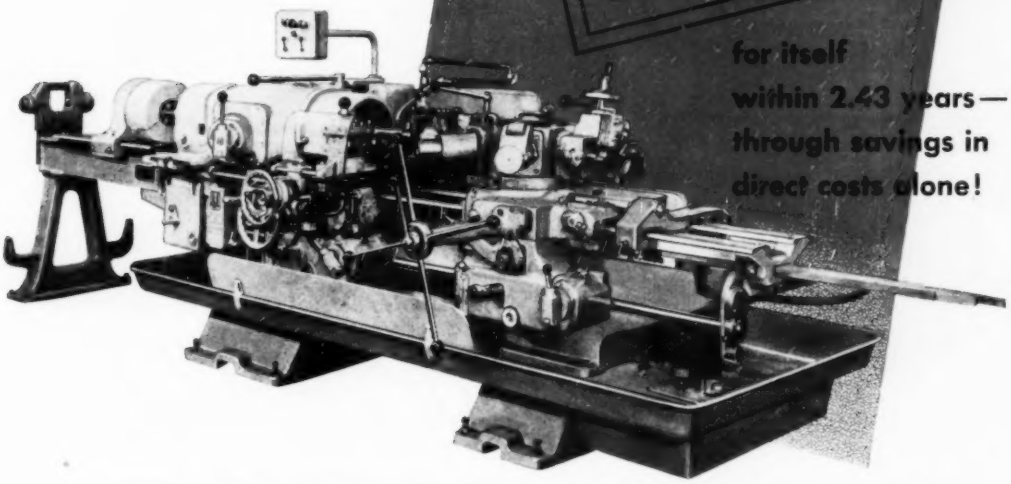
41% DIVIDEND

THE FIRST YEAR*

This Jones & Lamson Turret Lathe will have

PAID

for itself within 2.43 years— through savings in direct costs alone!



*Any investment which produces a 41% dividend the first year is worth looking into! The savings which produced this dividend were revealed by our analysis of a manufacturer's actual turning operations.

Even if your present machines are less than 10 years old, the purchase of a new Jones & Lamson Turret Lathe may be justified through *savings in direct costs alone!*

Let us determine what *YOUR* savings might be—what dividend *YOU* would receive each year from the purchase of a new Jones & Lamson Turret Lathe.

Write to Dept. 710-I for this FREE SERVICE.

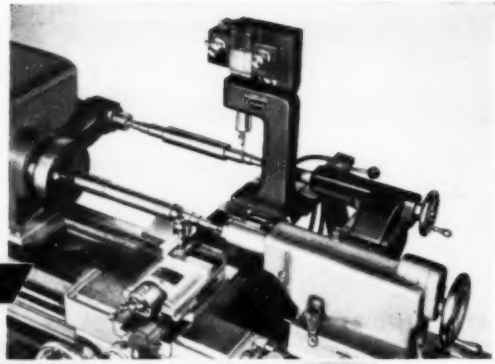
Turret Lathe Division

J&L JONES & LAMSON MACHINE COMPANY
Springfield, Vermont, U.S.A.

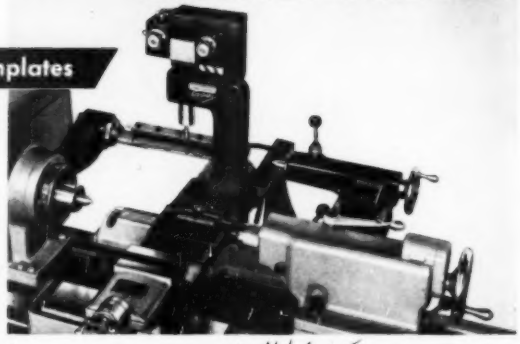
MACHINE TOOL CRAFTSMEN SINCE 1835

GET INSTANT CHANGEOVER...

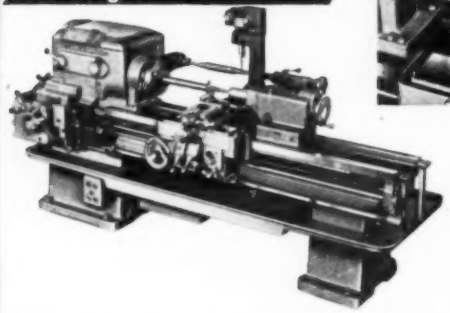
Duplicating from round templates



or Duplicating from flat templates



or Regular lathe work



with the *NEW* Lodge & Shipley COPYMATIC!

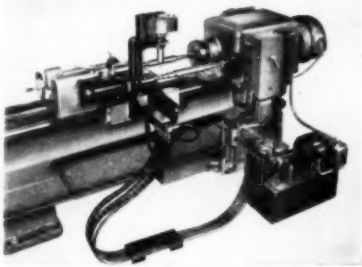
IT TAKES JUST A MINUTE to change from regular lathe work to automatic tracer controlled duplication (or vice versa). There are no attachments to take off... no gadgets to put on.

Using either flat or round templates, the COPYMATIC reproduces square shoulder faces, grinding necks, tapers in both directions, chamfers and curved contours with a high degree of accuracy. Often, the need for a special template is eliminated... the first piece of a lot may be produced by standard lathe operation, inserted in the holder and used to produce the rest of the lot automatically.

The COPYMATIC offers all the convenience and speed of hydraulic duplication, with all the versatility of the highly efficient Lodge & Shipley "Model X" Lathe. This double adaptability of the COPYMATIC takes it out of the special purpose machine classification, makes it a profitable producer for any size shop. Ask your Lodge & Shipley Representative for additional details or write for Bulletin #675.

• *Right:* A few samples of the wide variety of shapes produced by the COPYMATIC... both turning and boring operations are performed to very close limits.

• *Below:* Rear view of COPYMATIC, showing hydraulic power unit and mounting for template.



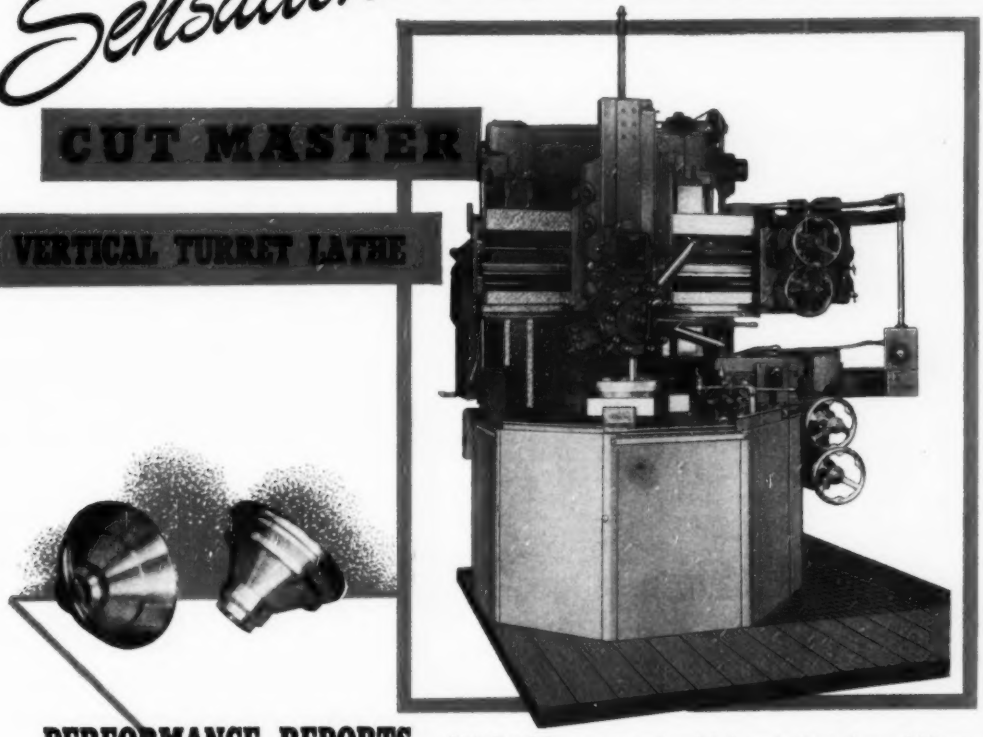
THE Lodge & Shipley COMPANY

MACHINE TOOL DIVISION • 3055 COLERAIN
SPECIAL PRODUCTS DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

The Sensational BULLARD

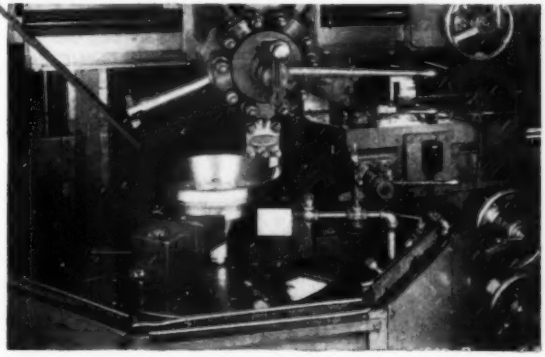
CUT MASTER

VERTICAL TURRET LATHE



PERFORMANCE REPORTS... 64" Cut Master on wheel job cuts time from 24 hours to 7 hours. — A new method of tooling and the speeds available on a 42" Cut Master cut floor to floor time from 1 hr. 50 minutes to 38 minutes. — Another 42" Cut Master cut job time from 1 hour 40 minutes to 23 minutes. — and yet another 42" machine improves over former method on endshields. Previously 1 piece required 1 hour 40 minutes. Now two shields are completed every 40 minutes. Let Bullard figure your jobs on Cut Master Vertical Turret Lathes. **The Bullard Company, Bridgeport 2, Connecticut.**

BULLARD



In 3 chuckings, 380 lbs. of stock was removed in 14¼ hours from a stainless steel forging of this bowl shell. Such an excellent finish was obtained, that a previous polishing operation was eliminated.

ARMSTRONG

Quality TOOLS

NOT A COST, BUT AN INVESTMENT

That Pays Year After Year...

Buy ARMSTRONG TOOL HOLDERS and TOOLS for today's job and they will bring you added profits thru the years. With ARMSTRONG TOOL HOLDERS you will be permanently tooled up for whatever comes, for each is a multi-purpose tool that takes cutter-bits ground to many shapes. Each is an efficient tool, refined thru a half century of world wide use. Each has strength beyond any need, extra strength resulting from endless research and the most modern closely controlled manufacturing methods.

ARMSTRONG TOOL HOLDERS are inexpensive too, for they are produced in great numbers. They are instantly available because they are carried in stock by all leading supply houses in sizes and types for every operation on lathes, planers, slotters and shapers; for standard operations on turret lathes and screw machines. They are profitable in use because they permit the highest speeds and heaviest feeds, and "Save: All Forging, 70% Grinding and 90% High Speed Steel."

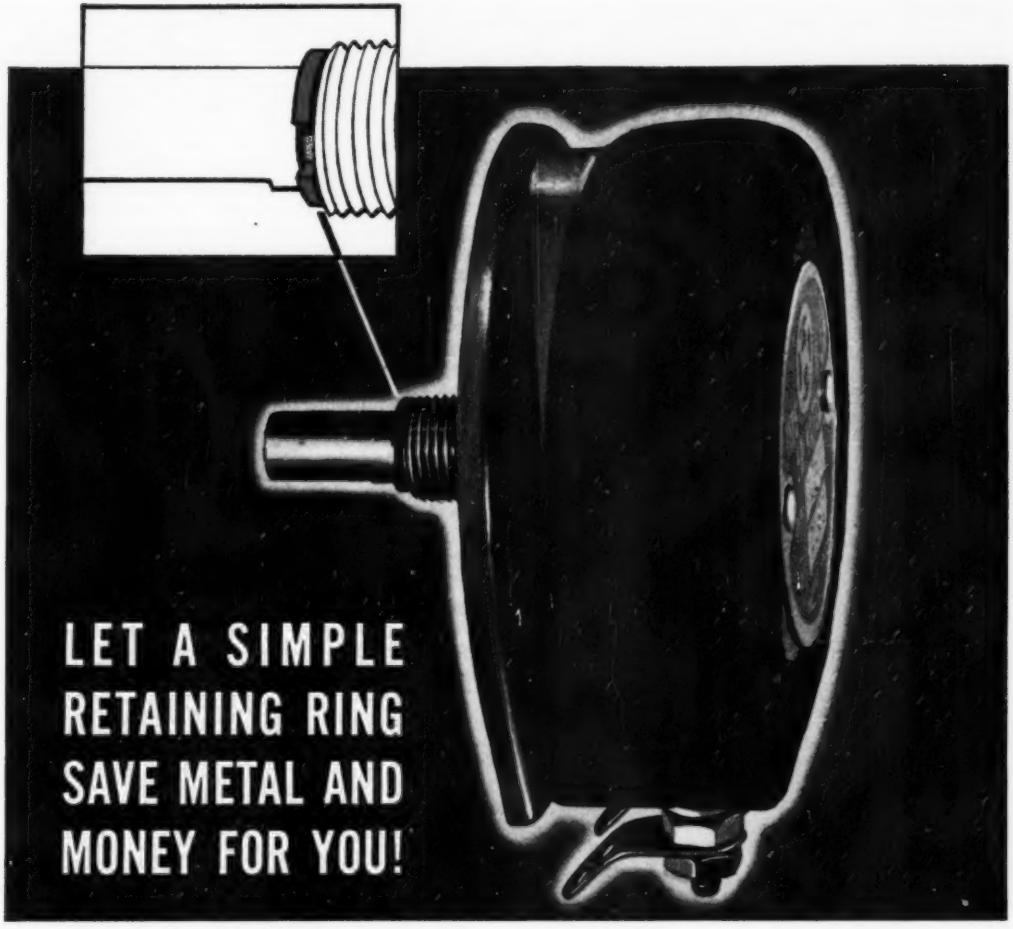
ARMSTRONG Lathe and Milling Machine Dogs are permanent tools too. They are drop-forged from special open hearth steel, are heat treated to extreme stiffness and toughness. They have alloy steel screws hardened at the tip to prevent up-setting and have double life, for hubs are made oversize to permit re-tapping.

ARMSTRONG Quality pays back over and over again. *Write for new S-48 catalog.* It offers many opportunities to conserve profits.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5215 W. ARMSTRONG AVENUE • CHICAGO 30, ILL.



On this finely made rheostat retaining rings saved material and assembly time. They save money both for Hardwick Hindle, the manufacturer, and for its customers.

Looking at this application you may say it was obviously a "natural," but there are literally thousands of cases where retaining rings can save as much or more.

Examine your machines and products to see where the use of these inexpensive modern artificial shoulders can cut your costs.

It's needlessly expensive to hold a mechanism in place with unnecessarily big shoulders or collars, or to temporize with small cotter pins etc., etc.

Let us show you how these high grade steel rings can do a thoroughly efficient job, saving money for you and for your customers.

More and more applications of retaining rings are being made every day.

Write today for descriptive folder.

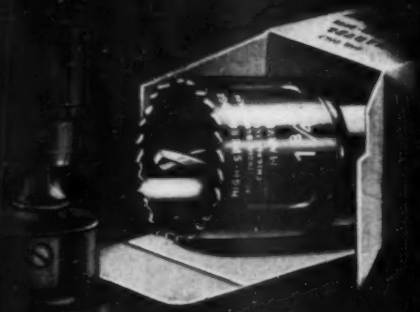
THE NATIONAL LOCK WASHER CO.

NEWARK 5, NEW JERSEY • MILWAUKEE 2, WISCONSIN, U. S. A.

Metal Cutting

MARVEL SAWS

Better Machines–Better Blades



Regardless what type hack saw machines and metal-cutting band saw machines you use, MARVEL BLADES will improve performance. There are sound reasons why this is true; practical reasons that are easily understood and demonstrated.

MARVEL High-Speed-Edge Hack Saw Blades, with a genuine high-speed-steel cutting edge integrally welded to a tough alloy steel body, are both fast-cutting and *positively unbreakable*. This construction permits greatly increased speeds and feeds and tauter blade tensioning. Still, they last much longer than ordinary blades.

MARVEL High-Speed-Edge Hole Saws, with this same unbreakable construction and heavy-duty arbors, have the extra strength required for drill press and lathe use . . . rapidly saw holes from ⅝" to 4½" diameter thru steel of up to 1⅛" thickness.

MARVEL Band Saws are of selected quality. They come ready for use, pre-welded to size for each make and model saw. Individually boxed, they are protected against kinking, rusting or damage to teeth!

Write for Blade Catalog Sheet.

ARMSTRONG-BLUM MFG. CO.

5700 BLOOMINGDALE AVE. • CHICAGO 39, U. S. A.

To generate electricity for transmitting messages, the telegraph industry relied on batteries. Cells of the gravity battery were cumbersome jars — 12 in. high, 8 in. across. By 1893, finding space for thousands of jars threatened the industry's expansion. Crocker-Wheeler, oldest electric motor manufacturer, designed and built motor-generator sets. Each, occupying a space two ft. square, did the work of 500 of the old cells which took up more than 222 sq. ft.

When the Telegraph Industry escaped from GLASS JARS...

CROCKER-WHEELER *made motor news*

TODAY, 55 years and over a million motors later, Crocker-Wheeler no longer concentrates on the design and manufacture of special motors exclusively. But the pioneering spirit and engineering skill of Crocker-Wheeler that persuaded industry to adopt electricity half a century ago are still very much alive—in the performance of C-W standard motors today.

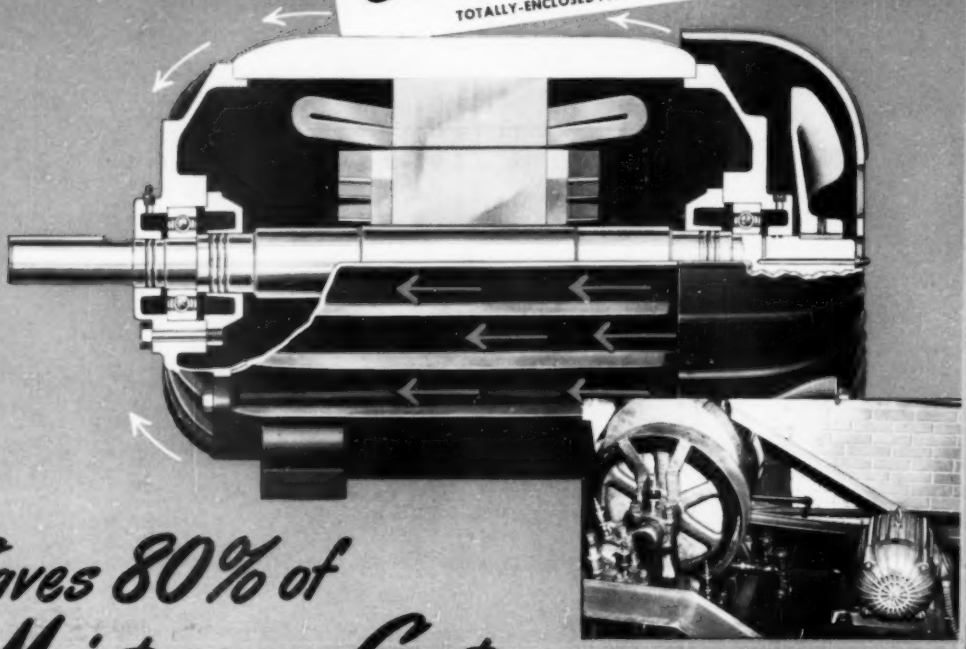
Past and present (yes, and the future) are inseparably fused at Crocker-Wheeler. A high percentage of the skilled workers who helped C-W make motor news through the years are still on the job, bringing to motor problems of modern industry a rare background of knowledge and engineering experience.

You'll understand what we mean (if you don't already know) as new, more efficient standard motors, developed by Crocker-Wheeler, are introduced in 1949. You can sense it just by *talking* to Crocker-Wheeler when you have a difficult motor problem. Here, you will say, is a master of the art of motor-making—but more than that, the kind of organization with which you would like to do business. Crocker-Wheeler Electric Manufacturing Company, Ampere 3, N. J.

AND CROCKER-WHEELER IS MAKING MOTOR NEWS TODAY

CROCKER-WHEELER *Sealedpower* MOTOR

TOTALLY-ENCLOSED . . . FAN-COOLED



Sealedpower Motor driving a vertical triplex power pump where moisture is excessive.

Saves 80% of Maintenance Costs

You can make maintenance savings of 80% and *more* with Crocker-Wheeler Sealedpower Motors. The secret? C-W dollar-saving design. No other totally-enclosed, fan-cooled motor has *exterior* cooling, with the fan-driven airstream blowing over a finned frame, carrying dust and fumes *outside* and *away*. (The outside fins that identify a Sealedpower Motor provide over 150% more cooling surface.)

But that's not all — this motor keeps cooler longer because it keeps cleaner. There's no place for lint or dirt to *collect* . . . nothing to hold heat *in*. Even on the really dirty jobs, a Sealedpower Motor will keep production going many times longer than "ventilating passage" motors, without a shutdown for cleaning.

For years of cool, clean operation and low maintenance cost, specify Sealedpower Motors. They're stock motors made for the toughest service. In new ratings from 3 to 60 hp.

Crocker-Wheeler Electric Manufacturing Company, Ampere 3, N. J. Division of The Joshua Hendy Corp., Branch Offices: Boston, Buffalo, Chicago, Cincinnati, Cleveland, Los Angeles, Milwaukee, New York, Philadelphia, Pittsburgh, San Francisco, Washington, D. C. Representatives in principal cities.

SEND FOR BOOKLET, "It's Different — it's a Dollar-Saver." Tells why the Sealedpower Motor will save money for you.

WHATEVER YOUR MOTOR REQUIREMENTS — CALL ON CROCKER-WHEELER

If Crocker-Wheeler builds it, it's a better built machine.

Horizontal and Vertical Protected-Type Induction Motors

A-C Generators and High Speed Synchronous Motors

Large D-C Motors and Generators

Turbogenerators

CROCKER WHEELER

ELECTRIC MANUFACTURING COMPANY, AMPERE 3, N. J.

Division of Joshua Hendy Corporation

This progressive die often needed daily redressing before Lehigh H was used. Now the die rarely needs attention more than once in six weeks. And it produces a much better surface on the door knobs which it blanks and draws from .035-in. steel or brass.

Photos courtesy of Stillman Hardware Manufacturing Co. Trenton, New Jersey.

A draw die of Lehigh H assures maximum production in shaping door knob parts on this 35 ton power press.

For maximum production *it's* LEHIGH H tool steel

"High-carbon, high-chromium" is a brief description of Lehigh H. But it's outstanding as a tool steel for maximum production because it combines these three big features:

★ Maximum Wear-Resistance
★ Air-Hardening for Safety and Minimum Distortion
★ Deep-Hardening with High Compressive Strength

Lehigh H is a tool steel that just can't be surpassed when you have a tool and die job involving one or more of the following requirements: *Long Runs, Close Tolerances, Safe-Hardening, Severe Service.*

Make your tools and dies from Lehigh H for blanking, forming, drawing, punching, shearing and bending. And it's a top-choice steel for lamination dies, shear blades, wearing plates, gages, bending rolls, and the like.

Lehigh H is stocked in popular sizes by Bethlehem Tool Steel distributors in principal cities. The nearest Bethlehem sales office can give you full information. Better still, order a test piece for a trial in your own shop.

Typical Analysis:	C	Cr	V	Mo
	1.55	11.50	0.40	0.80

Working Hardness: Rockwell C-58 to 62

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

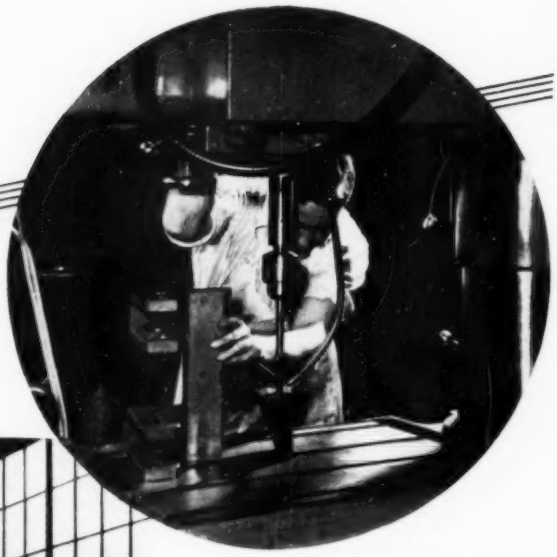
Export Distributor:
Bethlehem Steel Export Corporation

BETHLEHEM STEEL

LEHIGH H . . . one of Bethlehem's Fine Tool Steels

FOSDICK *Sensitive* RADIALS

for greater efficiency on more operations!



Illustrating an interesting job being drilled on a FOSDICK Sensitive RADIAL at the plant of Benjamin E. Jarvis, Newark, N. J.

● One of the outstanding advantages of this new FOSDICK Sensitive RADIAL is the big increase in range of sensitive operations it can handle—easily—quickly—economically.

The one piece column provides additional strength and rigidity. The adjustable table which can be moved either by power or hand assures work in correct position for the job at hand. The flexibility of the table and arm, both of which swing in an arc of 360° on the column, permits a wide range of work to be handled and the arm at fixed height assures ease of operation on all jobs.

The machines are available in 3 and 4 foot sizes. There are nine spindle speeds and four feeds and both speeds and feeds are controlled by direct reading levers on the head.

For complete details write for the Fosdick Sensitive Radial Bulletin, S.R.A.

FOSDICK MACHINE TOOL *Company*
CINCINNATI 23, OHIO

"TEXROPE VARI-PITCH SPEED CHANGERS Boosted Our Output"

"With these clean, compact units we can change speeds without stopping, get in-between speeds we need," says spinning mill foreman.

STEP UP MACHINE OUTPUT in *your* plant with the same variable speed drive that makes spinning mill foreman Ralph Finkboner of Rochelle, Illinois so enthusiastic. Texrope Vari-Pitch Speed Changers give you smooth, accurate speed control at the turn of a crank. You operate your machines at exactly the right speed for highest production. You change to different speeds for different types of material in seconds.

V-belt drive cushions Texrope Vari-Pitch Speed Changers against shock loads. Design is simple, compact, smooth running and easy to keep clean. Capacities range from 1 to 75 HP with stepless speeds up to 3.75 to 1.

The Texrope line also includes Vari-Pitch variable speed drives with stationary or motion control which will solve many variable speed drive problems at low cost. For details on all Texrope drives, the most complete V-belt drive line on the market, see your A-C Authorized Dealer or District Office or write for Bulletin 20B6051G. Also in Sweet's.

Texrope Super-7 V-belts result from the cooperative research of Allis-Chalmers and B. F. Goodrich; and are sold only by A-C dealers and offices. Texrope and Vari-Pitch are Allis-Chalmers trademarks. A-2645

ALLIS-CHALMERS, 999A SO. 70 ST.
MILWAUKEE, WIS.

ALLIS-CHALMERS

Sold . . .
Applied . . .
Serviced . . .

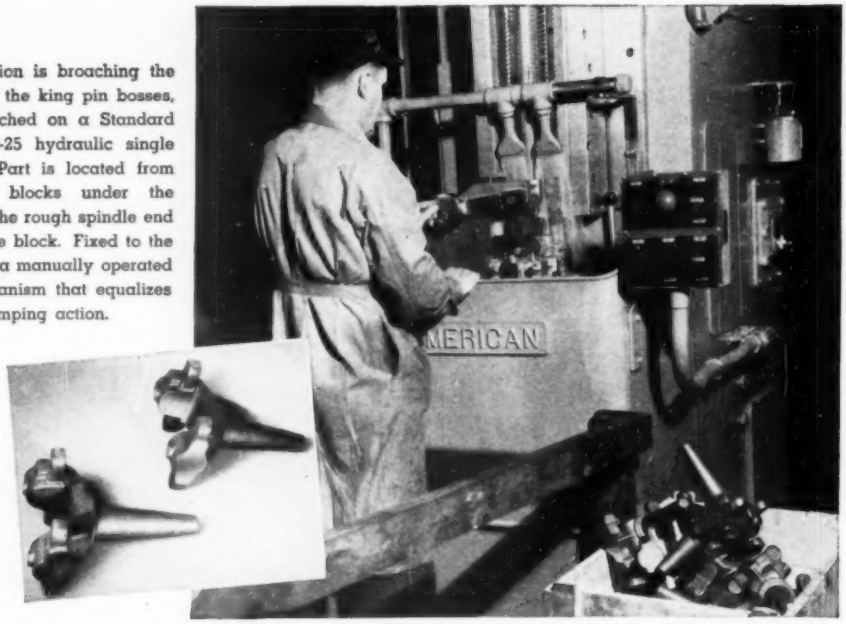
by Allis-Chalmers Authorized Dealers, Certified Service Shops and District Offices throughout the country.

MOTORS — ½ to 25,000 HP and up. Matching Allis-Chalmers Control.

TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.

PUMPS — Integral motor and coupled types. Sizes and ratings to 2500 GPM.

The first operation is broaching the four surfaces of the king pin bosses, which are broached on a Standard *American* SB-66-25 hydraulic single ram machine. Part is located from fixed locating blocks under the bosses, and on the rough spindle end with floating Vee block. Fixed to the machine ram is a manually operated equalizing mechanism that equalizes part prior to clamping action.



FOUR MAJOR PRODUCTION OPERATIONS

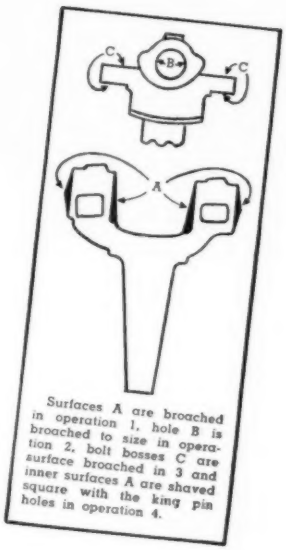
on truck steering knuckle bosses

performed by *American* BROACHING MACHINES

Broaching eight flat surfaces and a king pin hole in truck steering knuckle bosses brought maximum production economy to the midwest plant of a leading truck and farm equipment manufacturer. The four machining operations are listed in broaching sequence below:

1. Inside and outside surfaces of king pin hole bosses surface broached on an *American* SB-66-25.
2. King pin hole broached to size using an *American* VP-3-10-30.
3. Top and bottom surface of bolt bosses broached to size on an *American* SB-48-15.
4. Inside face of bosses finished shaved square with hole on an *American* V-2-6 Ton Press.

This set-up is excellent evidence of the versatility of *American* Broach engineering. Perhaps you have a production step where one or more broaching operations can reduce costs — step up production. Write to *American* Broach, Dept. A, for information and descriptive circular. No obligations, of course.



Surfaces A are broached in operation 1, hole B is broached to size in operation 2, bolt bosses C are surface broached in 3 and inner surfaces A are shaved square with the king pin holes in operation 4.

AMERICAN *American* BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

See *American* First—for the Best in Broaching Tools, Broaching Machines, Special Machinery

This "jack-of-all-trades" uses TIMKEN® bearings to do all its jobs right

RUSNOK SPINDLES maintain high degree of precision and accuracy because Rusnok Tool Works, Chicago, Ill., like many other makers of fine machine tools, insists they be carried on Timken tapered roller bearings.

THIS Rusnok milling, drilling, and boring attachment utilizes an almost unlimited variety of cutters to do end milling, die sinking, boring, fly cutting and many other operations fast and accurately. Because accuracy is so essential in Rusnok milling heads, Timken® bearings are used to carry the spindle and keep it operating smoothly and precisely at any angle.

Timken bearings hold spindles in perfect alignment due to the line contact between the rolls and races. The spindle is firmly supported with no chance of deflection. Friction is negligible.

Timken bearings are made from Timken fine alloy steel, heat treated and case-hardened to give amazing resistance to wear. And they take any combination of radial and thrust loads.

No other bearings can give you *all* the advantages you get with Timken tapered roller bearings. Be sure you have them in every machine tool you build or buy. Look for the trade-mark "Timken" on the bearings. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

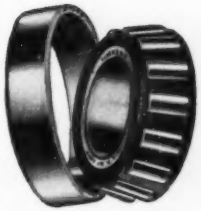
GENERATED UNIT ASSEMBLY

An extra step in the manufacture of Timken bearings—after assembly—results in a natural and true geometric contact being generated between all rotating parts.

This perfect mating of the component parts—cone, rolls and cup—assures positive roll alignment, long lasting precision, permanent adjustment and smooth operation.

TIMKEN

TAPERED ROLLER BEARINGS



NOT JUST A BALL ◯ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◫ AND THRUST ◫ LOADS OR ANY COMBINATION

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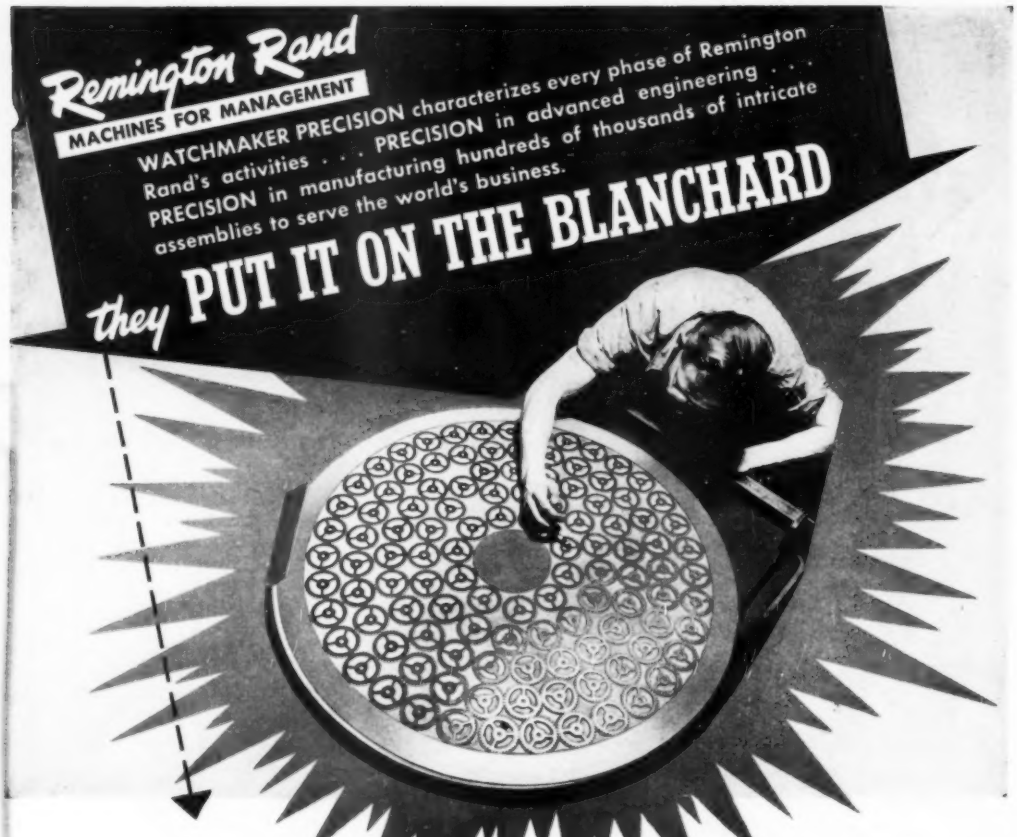
MACHINES FOR MANAGEMENT

WATCHMAKER PRECISION characterizes every phase of Remington Rand's activities . . . PRECISION in advanced engineering . . . PRECISION in manufacturing hundreds of thousands of intricate assemblies to serve the world's business.

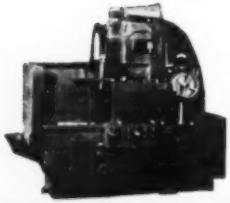
they PUT IT ON THE BLANCHARD



THE JOB: GRINDING BOTH SIDES OF PRINT WHEELS — TO LIMITS ±.00025". Material is No. 1010 Steel — 2.660" diameter x .100" final thickness. Stock removal per side is .009" to .013".

THE METHOD: *Remington Rand Engineers chose a No. 18 Blanchard Surface Grinder* . . . 113 print wheels are simply and quickly placed on the 36" magnetic chuck. . . .

THE RESULT: *which of course governed the choice of the most suitable machine* . . . two chuckloads or 226 accurately sized pieces (452 surfaces) per hour. Difficult grinding jobs are made simple with Blanchard Grinders.



Whether your flat surface grinding job is simple or seemingly difficult, Blanchard Engineers will gladly assist you in arriving at the most profitable solution. Avail yourself of this free, non-obligatory service.

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secure REPEAT ORDERS on the basis of PERFORMANCE

Cleereman Drilling Machines have introduced a new conception of drilling machine performance.

That is why present users send repeat orders . . . they know from their own experience exactly what Cleereman Drilling Machines will do. Prospective users want Cleereman after they have checked performance and maintenance records.

If you do not now use Cleereman Drilling Machines, let us refer you to an installation for your personal inspection.

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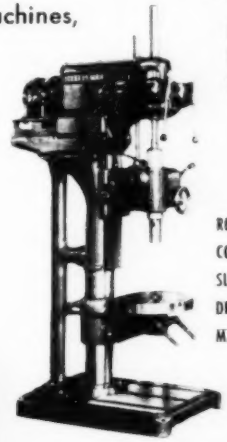
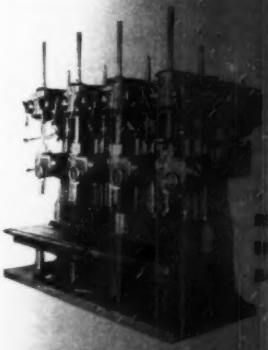


ROUND COLUMN SLIDING HEAD DRILLING MACHINE



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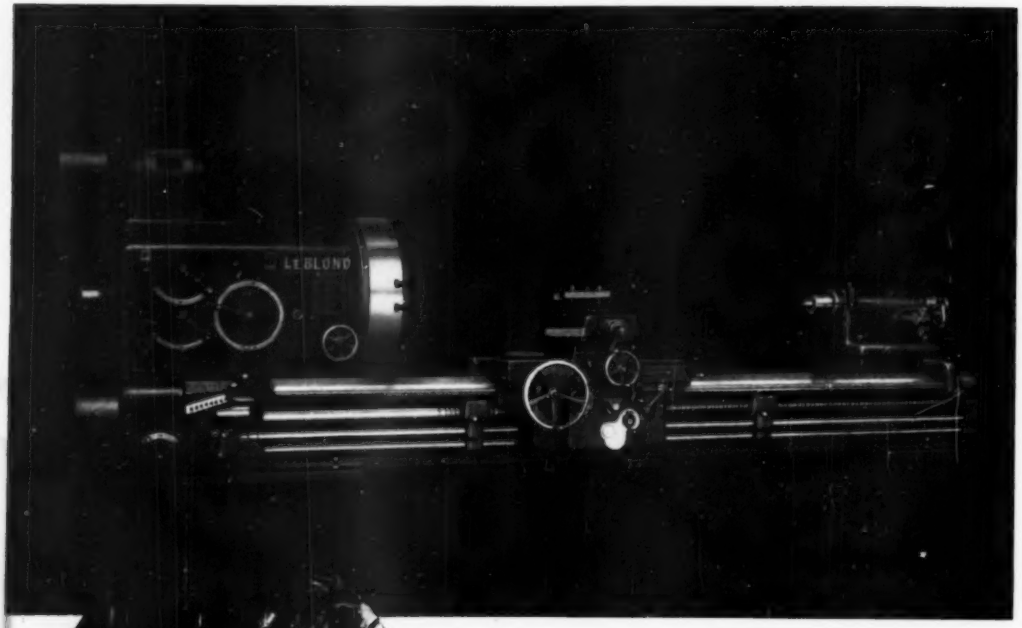

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40"-50" STANDARD FEATURES

- Feed box totally enclosed, lubricated automatically.
- 27-speed geared headstock.
- Periphery-driven face plate . . . 18 speeds.
- Hardened and ground steel bed ways front and rear.
- Power rapid traverse moves carriage effortlessly.
- Power angular feed to compound rest.
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Big lathes for big jobs. Gigantic in size, yet these powerful lathes are extremely easy to operate . . . produce the accuracy associated with much smaller LeBlond lathes. They present the capacity, power, and stability necessary for turning work of huge proportions. Smartly engineered, ruggedly constructed, they will produce with precision for years. Send for complete information today.

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LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES

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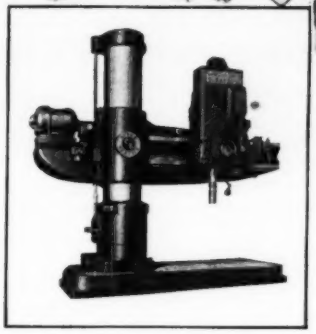

THE CINCINNATI BICKFORD TOOL CO.
RADIAL AND UPRIGHT DRILLING MACHINES
SUPER SERVICE
Radials 7½" dia. col. 2½" arm. to 26" dia. col. 12" arm.
General purpose Uprights, 21" to 28" sizes.
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Jig Borers Portable Horizontals
Spacing Table Machines

Equal Efficiency of Every Unit Makes the Balanced Machine

On EVERY JOB you do-

The smooth, chatterless, powerful and durable drive of the Cincinnati Bickford Super Service Radial Drill is a success factor in every job you do.

Driven by 10 splines machined from the solid, the driving gear is mounted on a special continuous bronze alloy sleeve which is carried by anti-friction bearings mounted on close centers.

Herringbone, continuous tooth gears are used for the lower speed ranges—for strength and smooth-rolling action.

The large continuous tooth gear never exceeds 500′ peripheral speed a minute, automatically declutches at high speeds and eliminates strains of flywheel inertia on high speeds and on spindle reverse.

Such design and engineering give Cincinnati Bickford Super Service Radial Drills great accuracy and a long life of trouble-free operation.

Write for the detailed bulletin No. R-29 for complete data.

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

Scratchless Stampings

Produced from 24-Gage Pre-Coated Stock

using DANLY Precision Die Set

Danly Precision Steel Die Set with dies used to blank and draw 14⅜" x 8" pan from 24-gage *pre-coated* lithographed cold rolled steel. Forming and curling are handled as secondary operations.

Drawing, blanking, forming and curling operations performed without marring satin-like finish

Here's an example of fine craftsmanship which is typical of the manufacturing methods employed by J. L. Clark Mfg. Co., Rockford, Ill. . . . producers of high quality lithographed steel ware.

Without marring or scratching the satin-like finish of pre-coated lithographed stock, the die illustrated blanks the center and produces an unusually smooth draw on this 24-gage steel pan. In a similar manner the edges are formed and curled in secondary operations.

Accurate punch and die relationship required

To assure accurate set-ups and precision results throughout, Danly 2-Post Precision Steel Die Sets are used, which are accurately machined top and bottom and equipped with leader pins and bushings lapped and honed to Danly precision standards. Because accurate punch and die relationship is maintained, full advantage is taken of the die makers' precision. The results are more stampings per grind, better product quality, and lower production costs.

Write for this *free* bulletin

Illustrates how you can use Danly's unusual machining service for special die sets to effect substantial savings in time and money.

save time { USE DANLY NATION-WIDE DIE SET ASSEMBLY SERVICE

Use Danly's specialized service to save time and money. Assembly plants listed below (marked with stars) stock interchangeable parts for quick assembly and delivery of any standard die set to suit your specifications.

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- ★ **Grand Rapids,** 113 Michigan St., N.W.
- ★ **Long Island City 1,** 47-28 37th St.
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DANLY MACHINE SPECIALTIES, INC.

2200 SOUTH 52ND AVENUE, CHICAGO 50, ILLINOIS

25 YEARS OF DEPENDABLE SERVICE TO THE STAMPING INDUSTRY

PRECISION DIE SETS, STANDARD AND SPECIAL • MECHANICAL PRESSES AND PRESS EQUIPMENT

SPOT NEWS OF METALWORKING

Small six-cylinder cars with wheelbases under 110 in. are being developed for the 1950 market by two independent car makers and by one of the Big Three. These economy models are being rushed to compete with similar types now being offered by Plymouth and Dodge. In addition, Willys-Overland has a new small six not yet released for production.

A "hole production" method of building airplanes rapidly, used by Germans in last war, is being made available to U.S. plane manufacturers by Air Materiel Command at Wright Field. Method consists of a system of construction parts having a row of accurately dimensioned holes. Advantages: (1) simple assembly line equipment, (2) elimination of large movable jigs and fixtures; (3) saving of time and material; (4) tacking time minimized; (5) no hindering form jigs or mounting points.

A machine for adjusting ring and pinion gears automatically and controlled by torque has been perfected by an automobile company in its rear axle department. When gears are quiet and properly adjusted, they have minimum torque.

Legislation on basing point pricing is unlikely at this session of Congress. Congressional leaders want to see first what U.S. Supreme Court will say in Rigid Steel Conduit case. This decision is not expected before June at the earliest.

Reo is preparing tooling to make a six-cylinder overhead-valve engine, with seven main crankshaft bearings. Crankcase will be suitab'e for use either as gasoline or diesel engine. Cylinders are of the wet-sleeve type.

Air Force is digging into its own reserves and into JANMAT for machine tools for its own plane production program. Drive is on now to adopt a plan whereby every reserve machine taken will be replaced by a new machine in the national "stockpile." Chances are slim, however, that this plan will be carried out because of lack of funds.

Plea for continuation of the present Taft-Hartley provision granting bargaining protection to professional employees was made at recent Senate Labor Committee hearing by Engineers' Joint Council, which asserted that regimentation of these people is incompatible with maintenance of true professional standards.

More drawings of German machine tools are being made available to British builders by British Ministry of Supply. Ordinary prints may be borrowed for a month and may be retained permanently if the Ministry is furnished with two sets of redrawn prints.

Since Communists came to power in Czechoslovakia, nation's metalworking plants have grown from 300 to 1100. Total has become so unwieldy for centralized control that industry has been divided into three sectors: heavy machinery, light machinery and general machinery. Plan is to cut down number of concerns and production programs of individual shops.

Packard will have torque converter automatic drive on its next models, with planetary emergency low and reverse gearing. This means a lot of new-type gear cutting machines will have to be bought.

An 8½-hp. four-seater aluminum automobile to retail for $1,000 is to be built in Australia by a new company to be formed by L. J. Hartnett, former chief executive of the General Motors branch plant in that country. Car will be designed to give 60 miles to the Imperial gallon at speed of 40 miles per hour. Plan is to make 5000 the first year.

Gaging Metalworking

Some soft spots have developed in the metalworking industries, in both heavy and consumer goods manufacture. But activities, on the whole, continue on a very high level and it is believed that a pick-up will occur in the spring months.

▸ Production more and more is being geared closely to current sales. Backlogs which have been large since the war's end are now whittled down to normal proportions in most cases. Moreover, inventories are being watched more closely than at any time since prewar days.

Steel Situation Begins To Ease

The steel situation is undergoing changes which promise some relief for users. Voluntary allocations still are affecting plate and sheet supply. Though the first quarter is causing worry to many consumers, there will be a better balance between supply and demand in the later months of 1949.

▸ Users resorting to conversion deals are almost daily examining their forward requirements to see how they can get away from paying such a heavy penalty for steel tonnage. And gray market operations have gone into what promises to be a permanent decline.

Some steel consumers are worrying about unbalanced supply in some locations because of the change in basing point practice.

Metalworking Index Dips

The four-point drop in the American Machinist Index of Metalworking Production between December and January parallels the slowdown in business across the nation at that time. The index registered a decline of about 2% in metalworking activities, while unemployment throughout the country went up in about the same proportion.

▸ Four of the five components dipped in January. Electrical machinery, industrial machinery, transportation other than automobiles, and the segment labeled "other metalworking" were off. The rise of motor car output was the only redeeming feature. It increased four points.

▸ Much of the falling off can be charged up to seasonal influences. Before the war, the index shows operations went down 3% or 4% in January. The metalworking industries apparently are returning to the old seasonal pattern.

Seller's Market Shrinks

The number of industries still enjoying a seller's market is rapidly dwindling. Five months ago some 14 major lines of products were in "tight supply." Today, only five continue in that classification: some makes of passenger cars, electrical equipment for utility plants, nonferrous metals (except lead), diesel locomotives and steel—that is, sheet, strip, pipe and tubing.

Pay Increases Granted

Though 1949 wage negotiations among the "pace-setting" companies and unions won't open in most cases until late spring, metalworking firms

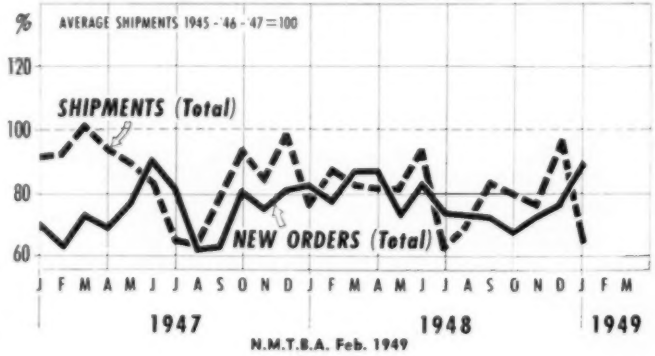
DATE	NEW ORDERS (Total)	FOREIGN ORDERS (Included in Total)	SHIPMENTS (Total)
1947			
JANUARY	71.7	21.0	91.7
FEBRUARY	63.8	15.8	92.4
MARCH	74.3	20.1	100.4
APRIL	69.8	18.8	93.3
MAY	76.9	16.3	89.2
JUNE	90.9	17.2	84.1
JULY	81.1	16.7	65.2
AUGUST	62.1	14.6	63.6
SEPTEMBER	63.7	14.7	77.0
OCTOBER	81.0	16.0	94.8
NOVEMBER	75.6	11.5	84.7
DECEMBER	81.1	14.8	98.4
1948			
JANUARY	83.1	14.0	75.3
FEBRUARY	77.3	12.7	87.1
MARCH	86.3	16.1	83.6
APRIL	86.3	14.1	82.0
MAY	73.5	11.4	82.6
JUNE	83.4	11.9	94.4
JULY	74.0	13.3	62.4
AUGUST	73.7	13.6	69.8
SEPTEMBER	73.1	11.6	84.7
OCTOBER	67.4	14.0	80.4
NOVEMBER	72.2	18.1	76.2
DECEMBER	76.7	16.2	96.9
1949			
JANUARY	p87.1	p21.9	p68.8

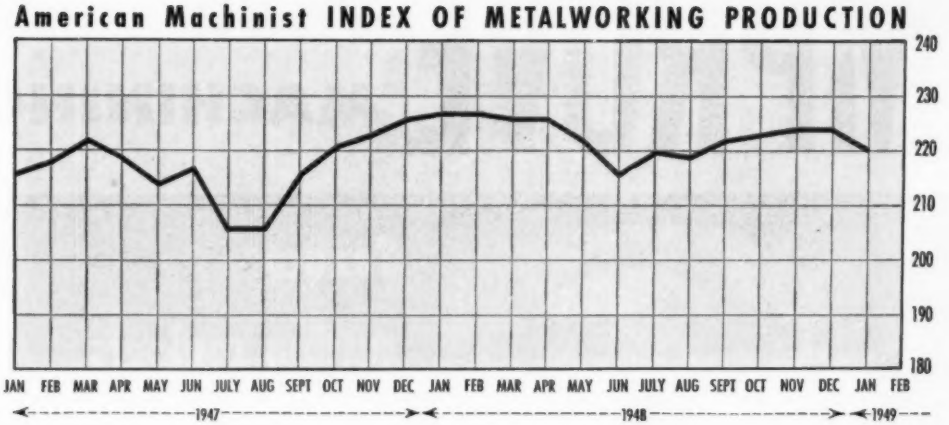
p—Preliminary figures

JANUARY MACHINE TOOL ORDERS CLIMB

Reports from the machine tool industry continue to be encouraging. The fact is that orders rose sharply in January, and shipments dropped far below the amount of incoming business. The result is that the industry's backlogs are higher than they were.

▸ February is believed to have been a fairly good month, though no figures are yet at hand. Some defense orders helped swell the total. Westinghouse has bought considerable equipment for its Kansas City jet-engine plant. The automotive industry, by contrast, is slim pickings for machine tool builders. The competitive urge, which once more is exerting itself, seems likely to bring about changes in 1950 models heretofore not contemplated. That would mean new tooling in several important spots.


%
AVERAGE SHIPMENTS 1945 - 46 - 47 = 100
120
100
80
60
SHIPMENTS (Total)
NEW ORDERS (Total)
J F M A M J J A S O N D J F M A M J J A S O N D J F M
1947
1948
1949
N.M.T.B.A. Feb. 1949



INDEX		COMPONENTS				
		MACHINERY	ELECTRICAL MFG.	AUTOS, TRUCKS	TRANS. PORTATION EQUIP.	OTHER METAL-WORKING
Jan. 1949.....	220	241	230	229	300	154
Dec. 1948.....	224	249	235	225	309	156
Jan. 1948.....	227	248	242	238	294	156

AMERICAN MACHINIST'S INDEX OF METALWORKING is based on manhours worked in five segments, which are "weighted" as follows: Machinery, 32.5—Auto & Trucks, 22.6—Electrical Manufacturing, 15.4—Transportation Equipment, 12.4—All Other Metalworking, 17.1. Index figures are a percentage of 1939, which equals 100.

are currently granting increases in many areas. These increases appear to be ranging from two to fifteen cents per hour. Most common of the "fringe benefits" are additional holidays and improved vacation plans. Scattered reports reveal improved insurance or health plans.

▶ This month General Motors' workers will take a pay cut of two cents an hour. It will be the first major pay reduction in the automobile industry in more than 10 years. The cut results from the decline in living costs, as measured by the consumer price index of the Bureau of Labor Statistics. Because the index dropped only about half a point in January from December, GM employees will be subjected to a smaller cut than UAW leaders and industry observers had anticipated. Economists expected the index to fall as much as two points, and that would have meant a pay slash of three to four cents.

Household Appliances Hard Hit

Many segments of the household appliance field have been hit by the shift to a buyer's market. Washing machines and vacuum cleaners in particular are suffering from a reduced demand. Refrigerators probably are the strongest item of all and should continue to sell briskly most of the year. One of the leading manufacturers has plans for building the largest number of refrigerators in history and has been acquiring sources of steel and other materials for such a schedule.

▶ Electric ranges and water heaters are being built in sizable volume. Automatic dishwashing machines are being made at a high rate, too.

Auto Makers Going Strong

Assemblies of automobiles stay well above the 100,000 mark each week. What is more, seasonal influences are about to be felt which should lift output a bit higher. But all doubt is now dispelled that the automobile industry has gone into the seller's market like other industries, except for a few popular-make cars.

This year still looks like a five-million-car year. 1949 promises to be one of the few years in the motor car industry's history when output will get up into the select five-million circle.

The farm implement and tractor business is in almost the same situation as the automotive industry. Production is high and there are no signs of serious weakness developing. Materials are not the worry that they once were.

ECA Orders To Increase

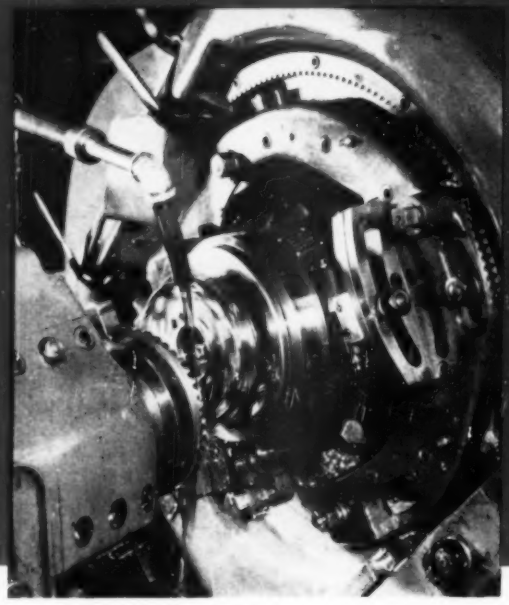
ECA machine tool orders still are little more than a trickle. But they should loom much larger within the next 30 days. It now is estimated that orders entered from Marshall Plan countries this year by machine tool builders should amount to $50 million or perhaps more. Many orders are likely to be taken later in the year which will not be shipped until early 1950.

▶ Distributors of machine tools say that inquiries are expanding and their salesmen are being invited into many more shops to look over existing equipment and propose suitable new machines to do the work. That is regarded as an optimistic sign.

Screw Machine Products Down

Screw machine products business should be down 8.8% this year from the 1948 level, provided there is no price change, according to a survey made among its members by the National Screw Machine Products Association in Connecticut, Massachusetts, Illinois, Ohio, Wisconsin, New York, Michigan and California. One hundred eighty manufacturers were represented in the poll. On take-home pay, the average guess was an increase of 1.2%.

IMPROVE YOUR MACHINING



Texaco cutting coolants help you cut faster, at lower cost, with smoother finish

IT makes no difference whether you machine steel, copper, aluminum, brass or any other metal . . . there is a *Texaco Cutting, Grinding or Soluble Oil* to help you do the job faster, cleaner and at lower cost.

Texaco Cutting, Grinding and Soluble Oils effectively lubricate work and tool — keep them cool and prevent chip welding or wheel loading. Thus, you get more cuts per tool grind, finer finish, fewer rejects — better machining whatever the metal or cutting method.

Let a Texaco Lubrication Engineer who specializes in cutting coolants advise you which Texaco oil to use for best results.

Just call the nearest of the more than 2300 Texaco Wholesale Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

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TEXACO CUTTING, GRINDING AND SOLUBLE OILS FOR FASTER MACHINING

Tune in . . . TEXACO STAR THEATRE presents MILTON BERLE every Wednesday night. METROPOLITAN OPERA broadcasts every Saturday afternoon.

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Needed: A New Depreciation Policy

When a United States Senator shows concern over the Treasury Department's depreciation policy on production equipment, that's news.

At least one Senator not only shows concern, but suggests what should be done about it.

He believes that a depreciation policy should be written into our tax system which would encourage the metalworking industries to retool their machines at least once every ten years.

In making this suggestion, he is thinking mostly in terms of our defense requirements. Our industrial facilities then would be in trim physical shape if an emergency should arise.

Though the Senator has not mentioned it, there is another factor to be considered. Keeping America's industrial establishments up-to-date with modern machinery is the best guarantee of producing goods of the highest quality at the lowest cost. That would be the peacetime dividend coming from such a policy.

The Senator feels that a tax program embodying speedier write-offs of production equipment will stand a good chance of enactment a year from now. It hasn't much chance at this session of Congress. Congressmen and Senators will have to be educated up to it.

The strange thing is that the proposed program has not made headway before. Other nations have carried it out advantageously for their own purposes.

Prewar Germany was a conspicuous example. Hitler wanted to expand his industries in anticipation of war. One of the first inducements that he offered manufacturers to replace old equipment with new was to give them the chance to depreciate new machinery for tax purposes in a relatively short period. The result was that Germany went into World War II with more machine tools and newer machine tools than America possessed. She had enough on hand to meet her military needs during the war years operating her factories on only one long shift.

Great Britain and Canada, like Germany, have offered their manufacturers the privilege of accelerated depreciation of new machinery. And many companies in those nations have accepted the offer. Modernization thus has been quickened.

Yet our own great country, trumpeted throughout the world as the shining example of efficient industrialization, has been notably backward about offering such inducements. The Treasury Department in Washington has persisted in clinging to its archaic policy of writing off most production machinery over a period of twenty years.

Every survey made in recent years among metalworking companies confirms the fact that most new equipment must pay for itself in a very short time (in less than five years, to be exact) or the prospective buyer will not order it.

Why is it, then, that the Treasury Department refuses to modernize its own policies when American industry is trying to modernize its own equipment?

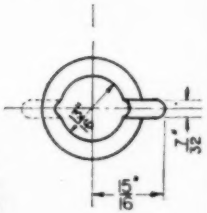
If Treasury declines to take the initiative, recourse should be had to Congress. Our national legislature should direct Treasury to modernize our depreciation tax structure, as the United States Senator suggests.

Instead of slapping on a tax penalty, Washington should offer a tax premium to manufacturers ready and willing to invest in new equipment.

Burnham Finney

EDITOR

IT'S A full-time SHAPER...



PHOTOS—COURTESY THE OHIO KNIFE CO., CINCINNATI, OHIO

PRODUCTION

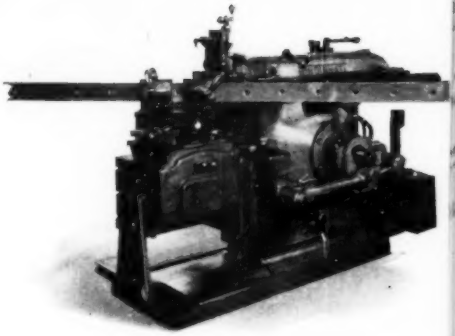
Working two shifts, full time, this Cincinnati Shaper notches fourteen plow-bolt holes in these shear knives every five minutes.

Shapers at The Ohio Knife Company are used strictly as manufacturing tools, for mitering, contour cutting, slotting, corrugating and beveling knife blades.

COSTS

The setups for all these operations are simple, rapid and inexpensive—and a low manufacturing cost results.

Write for Shaper Catalog N-3. It will help you determine the size and type of Cincinnati Shaper you need.



Knives are high carbon, high chrome steel. Cutting tool is high-speed steel. Shaper operates at 119 strokes per minute.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

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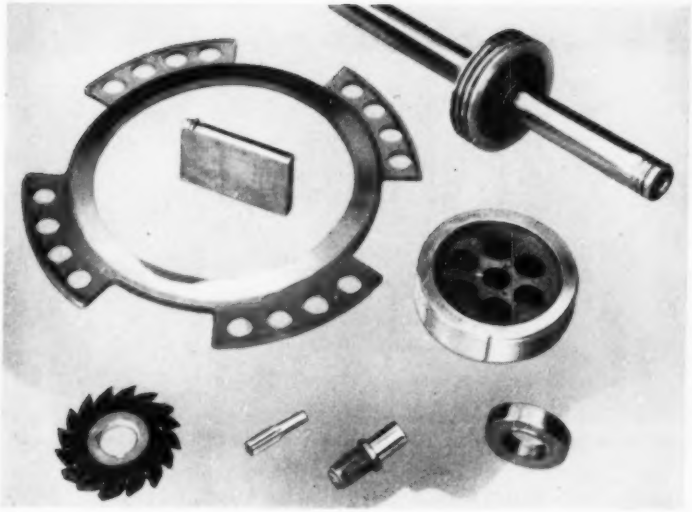


Gages, cutters and other parts after hard-chrome plating

HARD CHROME HAS ITS USES

World War II processes oversold hard-chrome plating as it did many products and services. But postwar applications have justified it for specific applications. Here they are—by the vice president of the Electroplaters

BY ARTHUR LOGOZZO, President, Nutmeg Chrome Corp., Hartford, Conn.

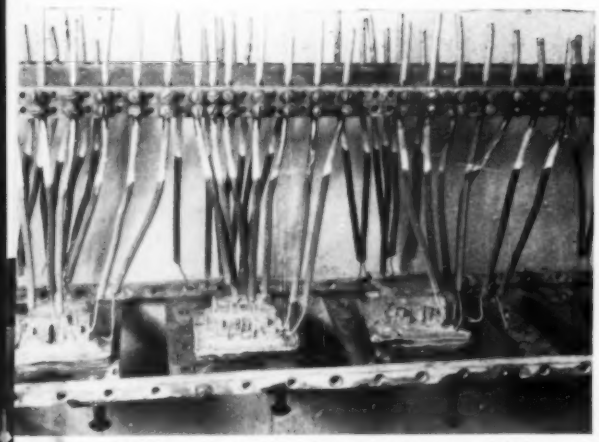
PHYSICAL properties of plated chromium must be understood for the proper application of this electro-deposited workhorse. It is a hard, dense metal with a pleasing appearance and has the lowest coefficient of friction of any metal. In shop parlance, it has a "slipperier" surface than any other metallic surface—analogous to the "water sliding off a duck's back" expression. The combination of hardness and low coefficient of friction gives hard chrome many uses.

On the other hand, there is a disadvantage in its extreme brittleness, particularly when applied in any depth. This brittle deposit makes a most unsatisfactory surface on anything involving impact, and has a pronounced dulling effect on cutting edges, thereby limiting the plate thickness on cutting tools.

Two factors accounted for the importance of the machine-part salvage program during the war: the round-the-clock operation of most machinery and the scarcity of replacement parts.

Spindles, shafts, pistons, and any machine part subjected to wear or scuffing were at one time plated for salvage purposes only. (It soon became evident that these salvaged parts outlasted the originals by several times. The result is an increasing tendency to make chrome plating standard on all such new parts.)

There are three main methods for salvaging machine parts: (1) hard-chrome plating (the "hard" means for industrial use—Ed.), (2) metallizing, (3) welding. Fortunately, there is no conflict between the methods. Chrome is used to minimize wear where a hard surface is required. Metallizing comes to the fore when a large amount of stock is to be added. Welding assumes the stellar role when broken parts require mending.



Mold forces, showing selective buildup on specific areas

Salvage airplane shafts are set up for chrome buildup

Journals on large rotors subjected to a constant wear are frequently salvaged by grinding out the score marks, hard-chrome plating oversize, then grinding to size. After having a considerable number of these rotors chrome-plated over a period of years, a large company decided to find out just how much longer these parts lasted after plating. The salvage supervisor found that a plated rotor shaft outlived the motor, with still no indication of breaking down.

Cast-iron bushings give much more satisfactory service when plated, particularly when in contact with a sliding member. The natural tendency of cast iron to "pick up" is overcome when covered with chromium. Another important item is the use of hard chrome in salvaging new parts machined under-size.

Chrome on Gages

Despite the plating of new gages by leading manufacturers, the larger part of gage-plating comes under the heading of salvage. This method provides a better gage than the original, its chief advantage being a longer, more consistent, wear life.

Any part that has a wearing surface: all types of gages, plugs, single or double-end; snap, thread and ring, can be salvaged and improved by plating. The procedure is to grind 0.003 in. or so undersize, plate 0.003 to 0.004 in. oversize, then grind and lap to size. This will provide a good surface with low frictional characteristics and usually extends the life from three to seven times.

On new gages, there are two schools of thought. One calls for a light plate of approximately 0.0001 in., the other a heavier plate as in salvaging gages.

The light-plate method is to lap 0.00005 to 0.0001 in. under size, plate 0.00015 in. oversize and lap to size. This method is particularly desirable on close-tolerance gages, as the part can be continuously replated economically with the light plate over a long period of time. The two grinding operations, necessary for the heavier deposit method, are replaced by double lapping.

As for a choice between the two, we can only give assurance that both are satisfactory and to select whichever one appears more feasible in a particular case.

In comparing chrome-plated gages with other alloy gages, we find chromium the most consistent in producing accurately gaged work over a period of time.

A practice of stress-relieving after grinding and after plating—developed and furthered in the last 10 years—has greatly enhanced gage life from a cracking and breaking standpoint.

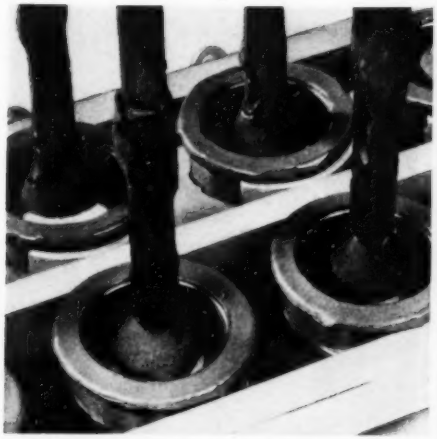
Cutting Tools

Hard-chrome deposits have been tried on all types of cutting tools. After much experimentation and grief, it was decided a light film around 0.00002 to 0.00005 in. would provide the necessary reduction in friction without any dulling of the cutting edge.

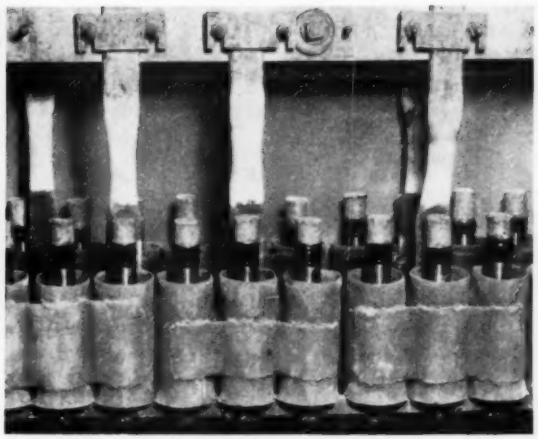
Despite statements to the contrary, the only function of chrome on a cutting tool is to provide freer chip removal. This means a cooler-running tool, reduced breakage, etc. Usually the best results are obtained on the softer steels and non-ferrous materials.

Plated taps have produced the most gratifying results, but only after good engineering. We have worked closely with a group of tap engineers and have been able to increase the use and results of plated taps many-fold. A light plate, 0.00002 to 0.00005 in., works well on 1010 or 1020 low-carbon, cold-rolled steel. Life is increased 10 to 20 times, and taps can be reground and replated. Less life is reported when plating is done for the second time. Plated taps have been tried on die-cast aluminum with spotty results. The differences seem to lie in the quality of casting, but no intense study has been carried on to date.

Plated taps, when used in brass, have proved favorable. Plating thicknesses have been used up to



Stopping off of areas not to be plated and proper anode arrangement for a heavy buildup are shown for bushings used in last war



Machine spindles ready for hard-chrome plating

0.0015 in., increasing tool life and improving work finish.

The plastics field has used chrome-plated cutting tools and taps for some time. Chrome shows to good advantage in the low-melting-point materials by its cool, free-running characteristics and by its resistance to abrasion in the impact materials. Thicknesses of plate can vary on taps used in the plastics industry in about the same ratio as when used on brass.

Hard-chrome plating in the plastics industry has aided and abetted practically every plastics operation from the manufacture of raw materials, molds, curing forms, press rams, to finishing tools.

In raw-material manufacture, because of the mixtures of fillers, resins, etc., and the various sticky stages they pass through, low-friction chrome lends itself perfectly. The blades in grinding mediums are frequently chrome-plated for corrosion protection, plus longer wear life. Rolls, used for both sheet stock and powders, last much longer when plated.

Preform dies, usually made of a tough steel, lack only corrosion protection and low friction, and chrome supplies this quality in most cases. White and colored materials are not subjected to dirt and iron-oxide pickup when preformed in chrome-plated setups.

PRE-POLISHING IMPROVES PLATE

When polishing a plastics mold, it should be remembered that chrome plate accentuates, rather than fills, digs and scratches.

If finish is important on the product, then particular attention should be paid to polishing both the unhardened and hardened mold. The more smoothing out of the soft steel, the easier the task is on the hardened surface.

Where a high finish is not too important, then the emphasis should be on blending in defects by running all hand operations with the grain of the steel. Several firms are now relying on vapor-blast, followed by chrome, on molds where finish is secondary. These molds are taken from the hardening room, checked and corrected dimensionally, vapor blasted, then chrome plated.

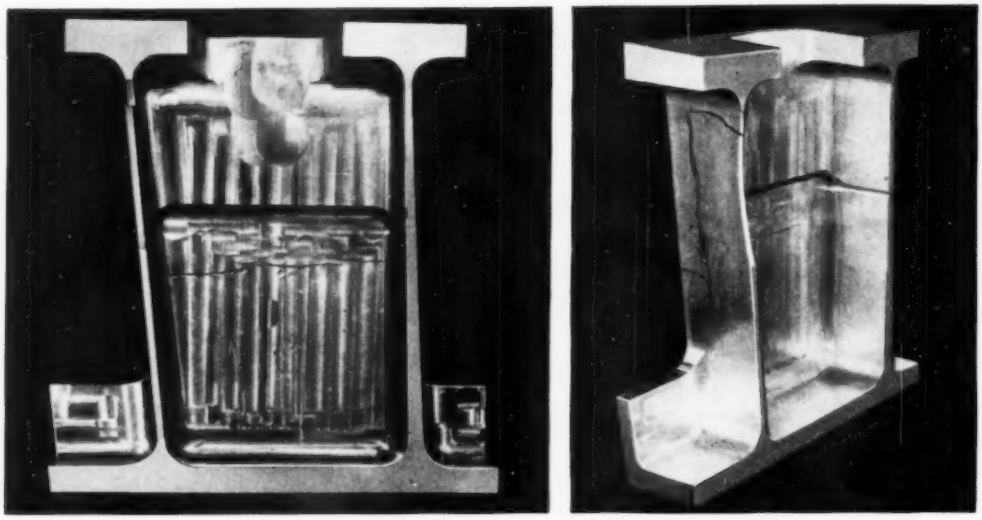
The die is usually plated on both faces and through the I.D. and on the faces of the punches only. This is to eliminate galling by running chrome against chrome, instead of the more effective way of steel against chrome.

The commonest application of plating is on compression and transfer-type molds. On injection molds, its use is confined to eliminating drag marks on deep cavities and for corrosion protection. Many injection machine parts, such as cylinders, pistons, and everything coming into contact with the material, are plated.

Compression and transfer cavities and forces are a must for chrome plating with all progressive molders. A freer flow, higher finish on the molded product, corrosion protection of the mold surfaces from gases of reaction, corrosion protection during down time (weekends, etc.), easier flash removal, no down time for polishing, are direct benefits of chrome surfaces. Transfer pots, plungers, pressure plates and sprues are plated.

Runners and gates in transfer molds are subjected to high localized pressures and heat, resulting in terrific wear, upsets material calculations. A procedure now becoming quite standard is to put 0.004 in. of chrome into these gates in new molds, and to salvage worn molds by building up with chrome.

The thickness of chrome on molds depends on size, and also types of compounds being worked. Abrasive compounds will require heavier deposits for wear protection. A good rule to follow is to deposit at least 0.0005 in. on all small molds, up to 0.005 in. on large housings.



INTERNAL STRESSES set up during quenching can "explode" a part through sudden release after severe machining. Peening near the fracture constituted the final abuse. The 8x10-in. hand-forged billet was an unwise selection of shape to be heat-treated prior to machining

Why Does 75S-T Often Misbehave?

A strong aluminum alloy, 75S-T requires suitable heat-treatment or it may quench crack or warp in machining. Certain shapes are preferred to avoid these troubles

By C. W. ALESCH, Chief Metallurgist
CONSOLIDATED VULTEE AIRCRAFT CORPORATION

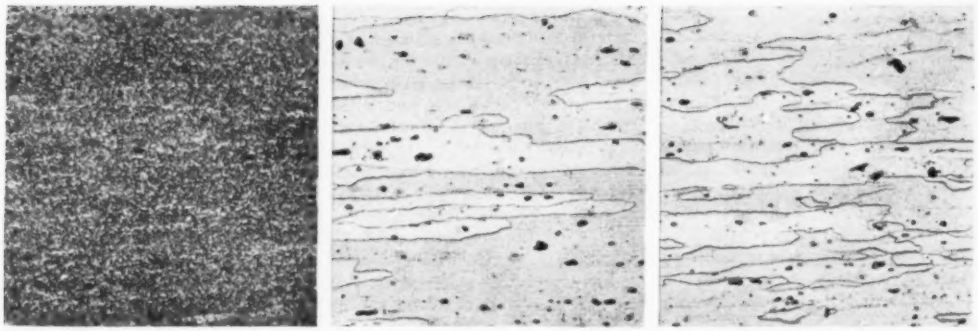
PERSONNEL who encounter 75S-T aluminum alloy for the first time are often perplexed by its unusual fabricating behavior. Without delving into involved technicalities, the alloy does require careful handling because: (1) it is a highly alloyed material; (2) it is a fully hardened metal in the form of 75S-T6 and (3) it is subject to the difficulties accrued in hardening a strong metal.

The 75S alloy contains about 1.5% copper, 2.5% magnesium and 5.5% zinc as major alloying elements and 0.2% manganese and 0.3% chromium as minor alloying elements. At ordinary temperatures aluminum has the power of holding limited amounts of magnesium and zinc dissolved in its basic structure. When these elements enter into the aluminum structure in this manner, they serve to brace it.

In assimilating magnesium and zinc, the aluminum becomes strained. Eventually a point is reached where the aluminum can assimilate no more alloy and it rejects the alloy elements in the form of compounds. But it is significant that in dissolving alloying elements, the aluminum is braced and strained, and therefore is strengthened.

When a metal is made stronger, it at the same time becomes less ductile. This fact is of fundamental importance in the handling of strong alloys, because they will not withstand as much deformation as weaker and more ductile materials. Being stronger, the strong alloys are more difficult to deform, but this does not necessarily mean that the only way to correct such difficulties is to get a bigger hammer.

Two diametrically opposite things are demanded of a usable alloy in its history. In the beginning it must be soft and ductile to permit shaping and forming. In its service life it must be strong and rigid to withstand applied loads. Fortunately, these two sets of conditions are not required simultaneously. This permits working a soft material which can subsequently be strengthened. With aluminum alloys, heat-treatment provides one method.



Effect of Heat-Treatment. Left—Annealed, or 75S-O, aluminum sheet has the characteristic "salt and pepper" appearance of annealed aluminum alloys after etching. "Pepper" consists of particles of agglomerated hardening agents. Center—Grain definition develcped by solution heat-treatment; hardening agents are dissolved in aluminum-alloy ground mass. Right—Lack of any apparent change from preceding phase indicates the submicroscopic magnitude of the precipitation hardening mechanism when the alloy is both solution heat-treated and precipitation hardened. In all three cases, the magnification was 250 times and Keller's etch was used

Of the alloying elements used in 75S alloy, copper well illustrates the mechanics of heat-treating. Copper tends to combine with aluminum, and the copper-aluminum compound is held in the soft or annealed 75S-O alloy in the form of relatively large chunks. This occurs because aluminum will not hold the copper-aluminum alloy upon slow cooling to ordinary temperatures and literally kicks it out to shift for itself. On the other hand, when the alloy is heated to a temperature just short of melting, the aluminum undergoes a change of heart and welcomes the copper-aluminum alloy by dissolving it.

This situation is seized upon during heat-treatment; the aluminum is tricked by plunging it into water. When this is done, the material is frozen and remains essentially in the high-temperature state of solution, because extremely rapid cooling does not give the aluminum time to reject the copper-aluminum alloy. Because the aluminum alloy is now forced to hold the hardening agent in solution at ordinary temperatures, this process is called a solution heat-treatment.

Solution heat-treatment does not fully harden or strengthen 75S alloy. In the as-quenched or rapidly cooled condition, it is relatively weak and ductile and can be formed and shaped to a degree.

The real purpose of solution heat-treatment is to promote a wide and fine dispersion of the hardening agent. This condition is desired because in the second, or precipitation, heat-treatment, the aluminum alloy is unfrozen under controlled conditions of temperature and time at temperature to allow the aluminum to reject the hardening agent in an orderly fashion. By this process the hardening agent is maneuvered out of the aluminum in the form of submicroscopic particles at widely dispersed points. These particles then serve as myriad keys for locking the aluminum mass.

Precipitation heat-treatment develops the full strength; air cooling is sufficiently rapid to maintain dispersion of copper-aluminum compound in fine particles.

Mass Cooling Effect

A price must be paid for the strength gained through heat-treatment. The heat can escape only from the outside layers of a piece; heat in the interior must be funneled through the outer layers. Because a crowd cannot all pass through a door at once, the innermost layers cool last and slowest. This gives rise to different rates of cooling throughout the piece and produces a mass cooling effect, generation of internal stresses in the piece, and warpage or quenching distortion.

The term "mass cooling effect" means simply that since the speed of cooling varies from surface to center of a piece, the excellence of solution will vary from surface to center. The slower the material is cooled, the more chance the aluminum will have to throw the hardening agent out of solution. In a finished item this manifests itself by a variation in strenth—strongest at the surface to weakest at the center. Experience indicates that a 3-in. thickness is the maximum in 75S alloy that can be hardened satisfactorily.

When metal is rapidly cooled, as in quenching, the outer layers cool first and bind the inner layers in hoop tension. The inner layers resist binding and consequently are loaded in compression. If the stresses so generated are greater during cooling than the strength of the material, quench cracks occur. To prevent cracks, it is necessary to avoid unsymmetrical sections, sharp corners and abrupt changes from light to heavy sections.

If stress generated during cooling is not greater than the strength of the material, the part remains in a balanced internal-stress condition. But, if surface layers are machined away, the stress system becomes unbalanced and the question of whether cracks occur or not depends on the amount of stress unbalance caused. An unbalanced condition is particularly undesirable with fully hardened materials where internal stressees of high

values are generated in connection with a condition tending to reduced ductility.

The mechanism responsible for establishment of internal stress is also responsible for quenching distortion. The latter condition arises because the hoop stresses in the strong outer layers pull on the softer and more ductile inner layers. To minimize warpage and quenching distortion, it is necessary to have parts which are symmetrical in section and of a shape such that they will be structurally stiff. Long thin sections are most likely to warp and twist severely.

Each form of 75S—that is, sheet, extrusions, die-forgings and billet stock—presents its own difficulties in processing. Sheet and extrusions often are difficult to handle during and subsequent to heat-treating, because they display a pronounced tendency to warp.

Die-forged parts and parts made from billets tend to give the least amount of warpage trouble, chiefly because they are generally chunky in form. These large chunky parts are likely to cause difficulties during machining subsequent to full hardening, because internal stresses are relieved. In general, to circumvent troubles arising from heat-treatment, it is well to form or shape the product as much as possible in the annealed state or as a forging, and then solution heat-treat. As soon as possible after solution heat-treatment, straighten the part; then apply the precipitation heat-treatment. After these steps, perform the last minor shaping operations.

It often happens that straightening of fully hardened 75S-T6 material is unavoidable. Avoid straightening this material when it is cold. It is possible, however, to straighten in moderate amounts, when the material is heated to 300 F. for 20 min. and worked at that temperature.

Watch Grain Direction

Grain direction can sometimes be a source of difficulty, especially with forgings and billet stock. Fortunately die forgings conform reasonably well with the final shape of a part and for this reason the principal grain directions can be aligned with the principal stresses the part must withstand.

The principal grain direction in billet stock usually is parallel to the long axis. Consequently, grain orientation in the piece will not necessarily be aligned with the principal stresses applied. This is significant because the strength of 75S-T transverse to the grain is approximately 11% less than that parallel to the grain. To prevent undue difficulties because of this situation, extrusions, forgings and parts made from billets should not be bent about an axis parallel to the grain. And in any event, a substantial fillet should be provided. This fillet should be about equal in radius to the outstanding flange.

The method of riveting customarily followed in aircraft shops, whereby upsetting is due to the pressure of the bucking bar on the rivet shank, is successful only because of deformation in the structure from blows struck by the gun plunger. These blows are repeated, suddenly applied impact loads. Where a structure is unusually rigid or the material has reduced ductility, such riveting can easily cause cracking. This method of riveting is especially harmful when applied to the outstanding legs or flanges of extrusions and forged fittings as, across grain, they may have somewhat reduced ductility. It is essential that parts to be riveted be provided with ample fillets. When such parts are riveted, the rivet should be squeezed if possible, or it should be struck on the rivet shank, or special rivets which do not require driving should be used.

Tips FOR TOP SHOP MEN

280 Be careful neither to underestimate nor to overestimate the men you pick for promotion. A man may make an excellent *production* executive dealing with details and concrete things, but be out of his depth when he faces the intangibles of *administration*. He may be a whiz at watching the trees and no good at watching the forest.

281 An essential to efficiency is regularity. The brilliant, but erratic—or the fast, but frequently absent—man will rarely show any efficiency. Remember the hare and the tortoise.

282 As a man moves up, he must show more initiative, more self-control, more ability to handle responsibility. He must be able to decide between intangibles of alternative solutions, timings, goals—and bat at least .500.

NEW LAYOUT BOOSTS SHOP OUTPUT

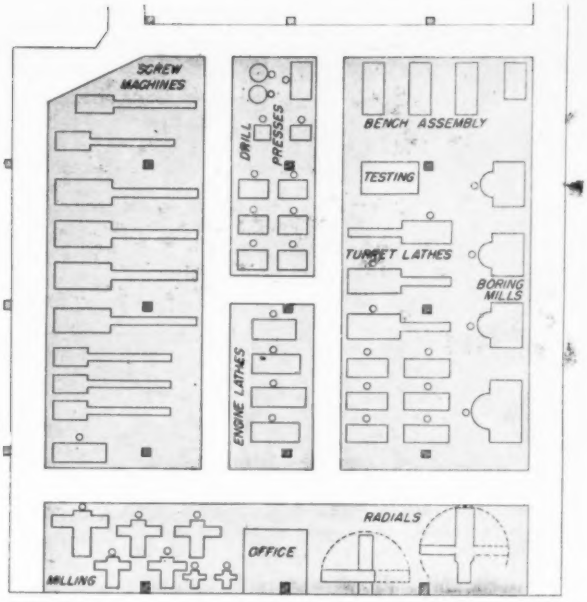
Revision permits better material handling, improves working conditions, and simplifies maintenance

BY WALTER RUDOLPH

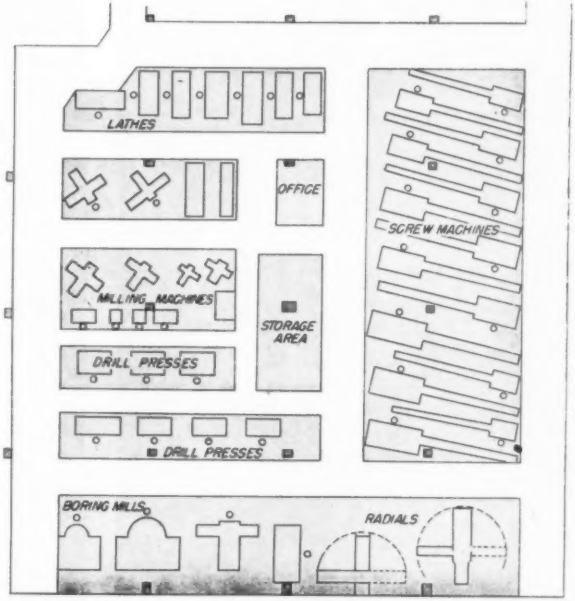
POOR LAYOUT puts the brakes on production. Material movements are slowed, machines are held up, and actual capacity is far below potential. Realizing this and faced with the need for higher output from its machine shop, American Sterilizer Co. turned the spotlight on layout. What showed up in this Erie, Pa., plant led not only to a new layout but also to a complete modernization of service facilities.

A survey of existing facilities revealed to management and engineers several major conditions that were holding down manufacturing efficiency. These were:

1. Materials-handling methods were antiquated.
2. Aisles were non-existent in some areas.
3. Large machines were located adjacent to small-parts storage, and the latter was across the shop from the machines it supplied.
4. Most machines had no properly defined parts-in-process storage area.
5. Some large machines had been installed backwards, requiring the operator to move material by hand from the rear to the front of the machine, rather than having it readily accessible at his side.
6. There were too many "hidden pockets," in which castings might accumulate and which were not



OLD layout was wasteful of space; aisles were inadequate and frequently choked with material; office at one end slowed dispatching procedure; areas for work in process were lacking



NEW layout provides more and wider aisles, greater accessibility to machines, and a centralized dispatching office. Repainting, new wiring, and air-line controls mean a cleaner, safer place to work and higher employee morale and productivity

Wide aisles allow fast mechanized movement of materials on pallets and skids. Adequate space around machines permits delivery of skid by hand lift truck. Aisles are marked and must be kept clear

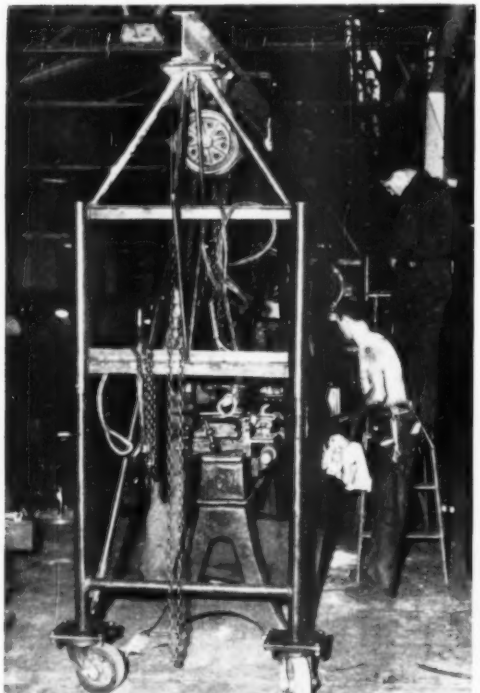
accessible for pallet and fork-truck handling.

7. New machines to be added could not be placed for the most efficient material flow.

Overcoming these problems became the objective of a new layout and involved the relocation of all but two of some 60 pieces of equipment.

As a result, 4- to 8-ft. aisles were established for lift-truck passage throughout the machining area, stores areas were located near machines using the material, maximum parts-storage areas with planned accessibility were arranged around all machines, and large machines were reversed so operators received material at their sides.

Another change involved the central location of an accumulating and dispatching area to expedite work-in-process and to save time on individual job change-



Mobile crane aided movement of smaller equipment. 12-man crew relocated 58 machines in two weeks. Crane also reduced danger of injury to members of crew

Multiple-spindle drillpresses were regrouped, relighted; shop wiring and air lines also were renovated. Rolling seats, used for years, speed production

overs by having the time keeper equidistant from all work stations.

The second phase of the program developed from the fact that the shop was dismal and cluttered with air piping and electrical wiring in haphazard array around most machines. To correct this, several steps were taken while the shop was being uprooted.

New wiring and electrical controls were installed: bus ducts were specified. In addition to improving general appearance, the changes increased safety and provided greater accessibility for maintenance.

Air lines were also overhauled and located for greater efficiency; controls on the lines were increased to reduce the danger of flying metal particles. Formerly, operators had incurred eye injuries when heavy pressure was applied to fine particles.

To brighten working conditions the entire machine shop was cleaned and spray-painted. As an aid to maintenance, steam pipes were painted red and electrical conduits black. It was also decided to mark aisles and storage areas.

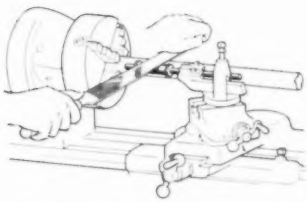
The changeover was the cause of only a few hours' loss of actual production time when machine operators returned to their jobs.

Today, production per manhour is substantially increased over that with the old layout, and is still increasing. In addition, worker morale is on a higher plane, and the entire machine shop presents a neater, better, operating picture.

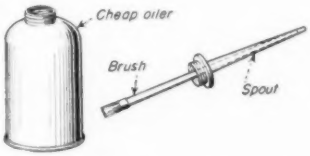
Dispatch cage in center of shop controls work-in-process. Paperwork is protected from shop dust by roof of metal sheeting

Short Cuts FOR THE SMALL SHOP

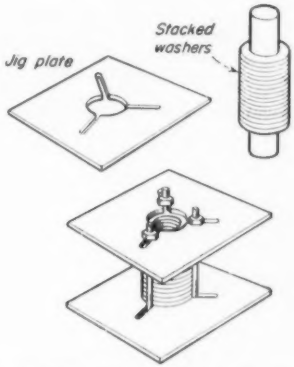
BY A. H. WAYCHOFF



FLATS CAN BE FILED on the work right in the lathe by using a roller guide. First, get a piece of drill rod 6 in. long that will fit the boring-bar holder. Second, procure a piece of steel about twice the diameter of the drill rod and longer than the widest file you will use. Turn down the second piece to leave a flange at each end, and drill a central hole for a running fit on the drill rod. Put the drill rod into the boring-bar holder and parallel with the work. Slip the file guide onto the drill rod. Lay the file across roller and work and file the flat to the depth you want. This trick will often save transferring the work to the milling machine.



DRY-OUT-PROOF containers for glue and shellac are easily made from cheap one-pint oil cans. Shave a brush handle so that it can be driven into the spout until the bristles will reach the bottom of the can. Apply a good gasket to the spout. If the glue thickens, the can can be set in hot water without danger.

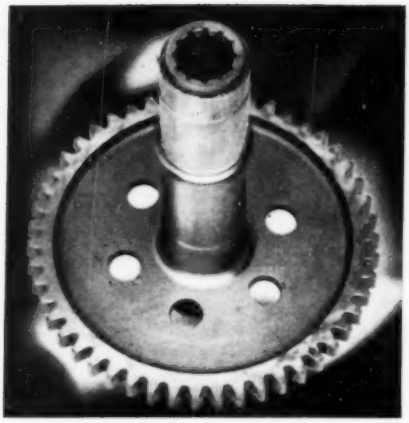


WASHERS THAT NEED to be drilled out to a larger hole size can be handled easily in this jig. Get two pieces of boiler plate, drill a central hole slightly larger than largest hole to be drilled in the washers. Then saw three radial slots out from the hole in each plate. Stack the washers on a mandrel. Assemble the top and bottom plates of the jig. Fasten them tightly on the stack of washers by means of bolts passed through the three slots.

HOW TO GRIND MEDIUM-PITCH GEARS

Experience in grinding precision aircraft gears is the basis of this article. Many helpful suggestions are included

BY D. W. DUDLEY
GENERAL ELECTRIC COMPANY, LYNN, MASS.



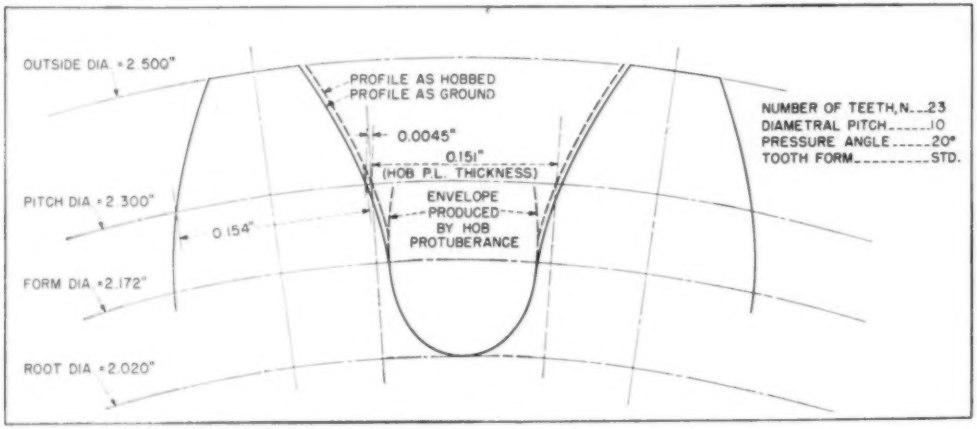
Many aircraft gears have carburized splines in an integral hub, and spline and gear teeth must be held in close relationship

AIRCRAFT gears have always been made to the highest degree of accuracy and loaded very heavily in respect to weight. During the last few years, the aircraft gas turbine has created new demands for precision, high-speed, heavy-load gears. For instance, on the propeller-drive aircraft gas turbine (commonly called the turbo-prop engine) a double-reduction gear-set is required to drive the propeller, and a number of miscellaneous gears drive the various accessories and handle engine starting. There are high-torque loads on the propeller drive gears and extremely severe loads of short duration in the starting train. The main-reduction, high-speed pinion runs at a very high pitch-line speed, and some accessory gearing also operates at quite high pitch-line speeds.

In the aircraft gas turbine, pitch-line velocities go up to 12,000 fpm. or higher, and intensities of tooth loading are as much as ten times those in conventional spur and helical gears for routine industrial applications. Thus this service demands the ultimate in gear precision and quality of material.

Tooth Accuracy

The ultimate purpose of the ground gear is to obtain both high accuracy and high hardness in the finished teeth. During the last few years, ground gears have been purchased from various sources and found to range all the way from 0.001-in. to 0.0001-in. tooth-to-tooth spacing accuracy, even though the drawings called for a spacing accuracy of 0.0002 in. or 0.0003 in. Some shops have taken the attitude that it was impossible to produce ground gears having accuracy greater than 0.001 in., while others have been willing to work to 0.0005 in., but no closer. Still other shops, with the same types of machinery, have produced gears within 0.0002 in. Leading manufacturers of gear-grinding equipment have quite consistently



LAYOUT FOR A 23-TOOTH PINION *cut with a G.E. standard pre-grind hob*

claimed that a very high degree of precision could be obtained from their equipment. On the other hand, users of gear-grinding machines have frequently been unable to achieve highest accuracy. We have found that high precision in tooth profile and tooth spacing can be obtained on several kinds of grinding machines manufactured within the United States.

Essentially the requirements for obtaining high precision are:

1. **Machinery in topnotch condition.** This may mean purchasing new machines, then adopting a rigorous system of maintenance and inspection to retain accuracy.

2. **Highest-precision index plates and other tooling and masters.** This requires the purchase of tooling to rigid tolerances and inspection of the tooling to be sure that every item of accuracy is held.

3. **Adequate inspection equipment for setting up and for control of machines.** Operator, foreman and inspector must form a close-working team to utilize the machinery and tooling supplied to best advantage and take the proper care and time to finish parts.

A recent check of a large lot of gears showed that 10% were within. 0.0001 in. max. tooth-to-tooth spacing, 50% were within 0.0002 in., 30% within 0.0003 in. and 10% within 0.0004 in. as first ground. Where drawings do not permit more than 0.0002 in. tooth-to-tooth spacing, the few gears not meeting the limits are usually lapped 4 or 5 min. or are reground to correct the limits. It is very seldom necessary to scrap a gear for grinding inaccuracies.

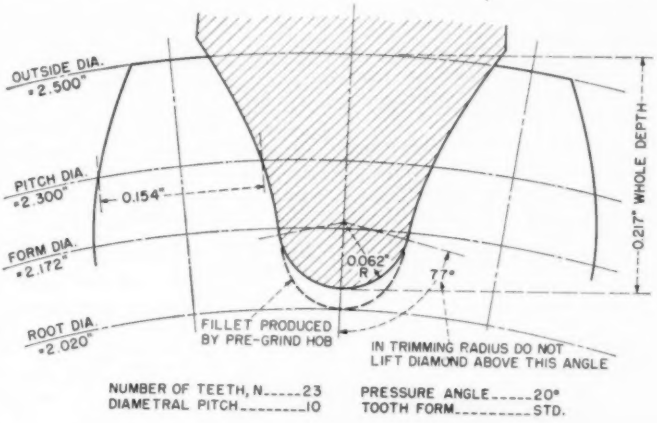
Maintenance of Machines

Like any other piece of machinery, grinding machines must be properly oiled and greased. A system of color codes has been found very helpful in indicating the kind of oil or grease to be used at each place on the machine.

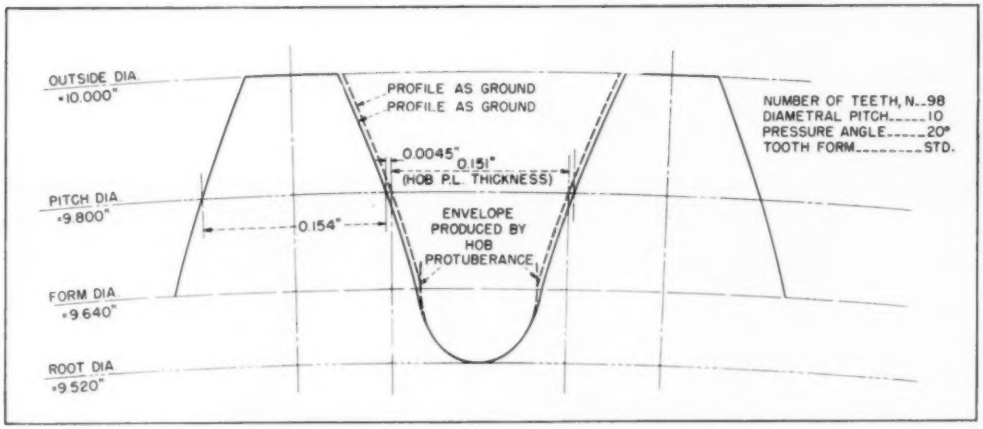
Several parts of the grinding machines may become worn or out of adjustment. Spacing errors on gears may be caused because the hydraulic indexing system does not work smoothly or the indexing plates become worn. It is usually necessary to check spacing every time the machine is set up for a different gear design—or if the same design is ground for several days the spacing must be checked at least once a day. Index plates or master gears are taken off and checked at least once every six months. Machine ways may become worn in spots if long production runs are made on gears all having the same face width. It is obviously good practice to check over the machine when changing from a production run on one kind of gears to a produc ion run on another kind.

Wear on the diamonds used to dress the grinding wheel or on other parts of the dressing equipment is likely to show up in gear-profile errors. When highest precision is required, it is frequently necessary to profile check each and every gear at the time it is ground.

Essentially, the problem of maintaining grinding machines demands that the operator and foreman be continually alert to spot any sign



***ONE TYPE OF GRINDING WHEEL** which can be used to finish a pinion with unground root fillet*



***A LAYOUT FOR A 98-TOOTH SPUR GEAR**, again for a standard hob*

of trouble on the machines; then that they correct the cause immediately, before a large stack of faulty gears are produced.

Burns and Grinding Cracks

When aircraft gear work was first started, there was considerable trouble with burns and grinding cracks. Recently, I asked the foreman whether there was still trouble along this line, and he stated that in the last six months, during which thousands of gears were made, they had had only one gear scrapped because of grinding cracks. Each gear is given a rigorous Magnaflux check and other inspection, so it is not possible for grinding cracks to remain undetected.

The shop has found that several factors must be properly and rigidly controlled to eliminate grinding cracks. These are:

1. **Choose proper grinding wheel.**

2. **Dress wheel rough for roughing cuts and dress wheel fine for finishing cuts.** In grinding a typical 90-tooth, 12-pitch gear, we dress the wheel twice for roughing passes and twice for two final finishing passes.

3. **Proper feeds and speeds are essential.**

4. **Use proper material, free from non-metallic inclusions and dirt.** For aircraft gear work, the alloy case-hardening steels such as 3312 give better results than a straight carbon steel.

On 12-pitch spur gearing, a Norton 32A80H12VBEP wheel has proved very satisfactory. For roughing 12-pitch gears, a downfeed of 0.002 in. per pass seems to give very satisfactory results. On finishing passes, a downfeed of 0.0005 in. usually gives good results, although occasionally it may be necessary to reduce this amount. Where grinding is done only on the sides of the teeth and root fillets are left unground, it is possible to use somewhat greater rates of downfeed. The crossfeed rate for a 12-pitch gear is about 25 fpm. It does not appear that the choice of crossfeed rate is quite as important as the proper choice of downfeed rate. Grinding wheel speed for the 12-pitch gear is about 4500 fpm.

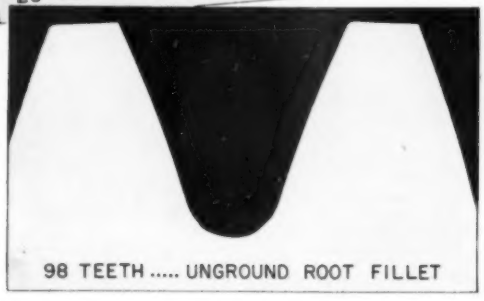
Time Required to Grind Gears

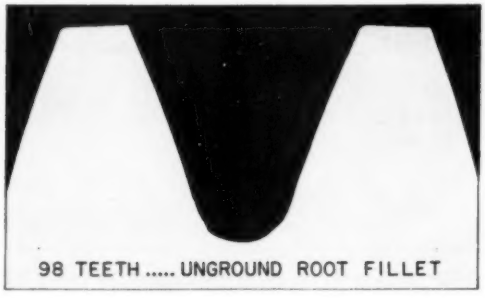
It takes longer to grind highest-precision and highest-quality gears —but not as long as might be expected. In roughing, the limitation in speed is chiefly how fast metal can be removed without burning or cracking the work. To obtain highest precision, two finishing turns seem to be required; it would perhaps be possible to eliminate one or both finishing turns if close accuracy were not desired. Grinding-machine operators tell me that this would only save 1 5 to 1 3 of total time spent in actual grinding. To obtain high quality, it is necessary to do frequent and rigorous checking which may go as far as checking the profile on every gear ground. Spacing may require only infrequent checks, perhaps once a shift. And it may be possible too that it would not be necessary to dress the wheel so often, although again the dressing of the wheel affec's grind ng cracks as well as accuracy, so frequent dressing is required even if dimensional accuracies are not being closely held.

Unground Root Fillets

Where greatest tooth strength has been needed, it has been found quite advantageous to leave root fillets unground. A protuberance type of pre-grind hob finishes the root fillet completely before grinding, then special wheels grind only the working sides of the teeth and secure a good blend between the ground and unground portions of the tooth. Some manufacturers have claimed that special hobs must be used for pinions, but we have found it possible to use our own standard hobs unless number of pinion teeth is abnormally low.

***ACTUAL GROUND GEARS** with 23 and 98 teeth. Blending is reasonably good, although not perfect. The two views below, of a 98-tooth gear, show best and worst conditions of blend on a single gear*





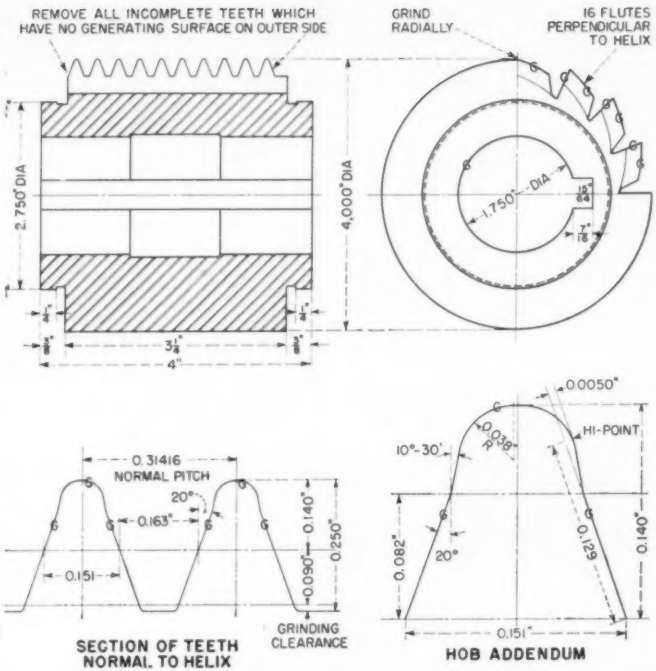
It is important to hold the case depth to close limits on carburized gears. Strength and wear tests both show serious reduction in load-carrying capacity when optimum case depth is not obtained. After the gear is carburized and quenched, there will be some distortion in the blank which will require more grinding in some places than in others and the heat-treating personnel will not hit the requested depth of case exactly. To complicate the matter further, many aircraft gears have carburized spline teeth in a hub integral with the gear and which must be held in close relationship to the gear teeth.

Case-Depth Rules

In the gear trade, case depth has often been established by rule of thumb as equal to 1/6th of the pitch-line tooth thickness. On a 10-pitch tooth having 0.154-in. tooth thickness, this would be equivalent to 0.026 in. In some applications, tests have shown excellent results with case depths as small as 1/10th or 1/12th tooth thickness. Excessive amounts of case depth tend to reduce the load-carrying capacity. In many designs, best results cannot be obtained if the case depth exceeds ¼ tooth thickness.

In measuring case depth, the usual practice is to consider all of the hardened layer as case, even though the inner part of the case is of intermediate hardness tapering off to core hardness. If only the fully martensitic part of the case, having a hardness of 58 Rockwell C or more, were measured as case depth, then the amounts of case depth mentioned above would have to be proportionally reduced.

In establishing a drawing tolerance for case depth, it is necessary to consider that stock removed in grinding may seriously change the case depth even though the part was carburized to a close figure. For instance, if a part was designed for an 0.025-in. case depth and carburized to 0.030 in. with 0.005-in. stock allowed for grinding, it would be theoretically possible to grind the gear to clean up all over and yet take so little stock off some places and so much off other places that the case depth on the finish-ground piece would vary from 0.020 to 0.030 in.



PROTUBERANCE DEVIATION FROM 20° TO P. A.							
DISTANCE FROM PITCH LINE	0.096	0.109	0.123	0.129	0.135	0.140	0.148
DEVIATIONS	0	0.0022	0.0045	0.0050	0.0045	0.0022	0

***A TYPICAL PRE-GRIND HOB** (single thread, right-hand) with protuberance tip to finish the root fillet before grinding. This particular hob is 10 pitch, to cut the 23-tooth pinion and 98-tooth gear shown. Location and amount of protuberance is specified by a table of deviations from a straight line. Successful use depends on close-accuracy hob making, particularly in tip radius and protuberance. The deviation table permits precise checking*

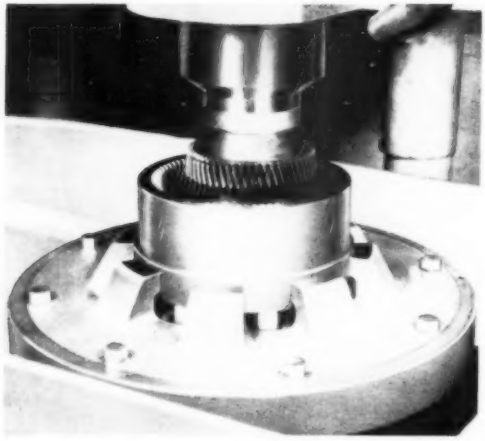
In General Electric practice, we have found it essential initially to carburize the piece to a very exact figure. Heat-treating technicians must come within 0.001 in. or so of hitting the exact case requested. This requires very consistent interpretation of furnace samples. Quenching dies reduce blank distortion to a minimum. Before grinding the gear it may be necessary to make measurements so the high points of the gear teeth and gear rims are known precisely in relation to the spline. Then by adjustment of the grinding arbor, the grinding cut can be started so stock will be removed uniformly enough to hold the case depth positively within drawing limits in all locations. In some cases the amount of stock left for finishing is made intentionally so small that it will be impossible to clean the gear up all over when the case-depth variation is exceeded. In this instance, the gear would be scrapped for dimensional errors each time the warpage was great enough to cause the variation in case depth to be too much.

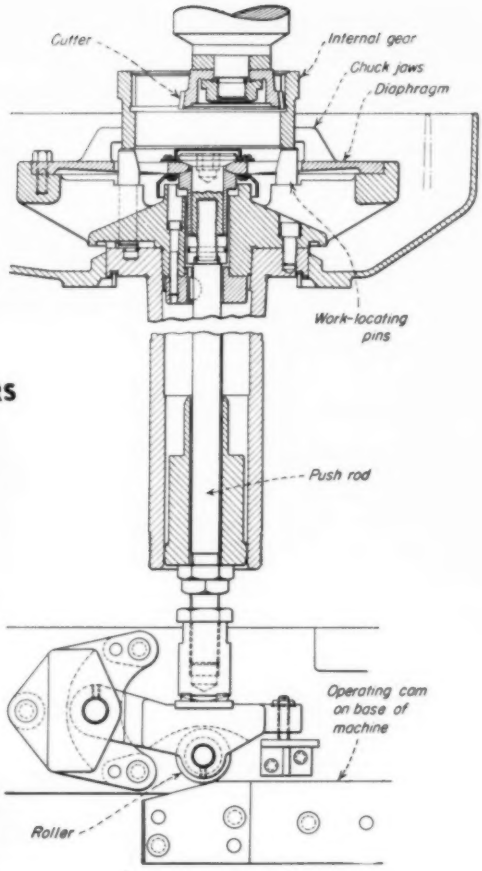
Our greatest present problem in the manufacture of ground gears is not in the grinding, but in control of heat-treat distortion *before* grinding, then in setting up the gears to grind to save as many as possible.

—Based on a paper presented at the Semi-annual Meeting, AGMA, Edgewater Beach Hotel, Chicago.

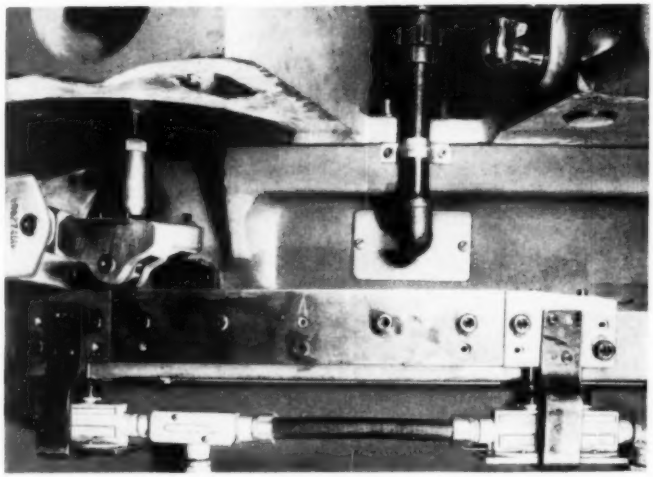
· TALENTED TOOLING

DIAPHRAGM CHUCK GRIPS RING GEARS

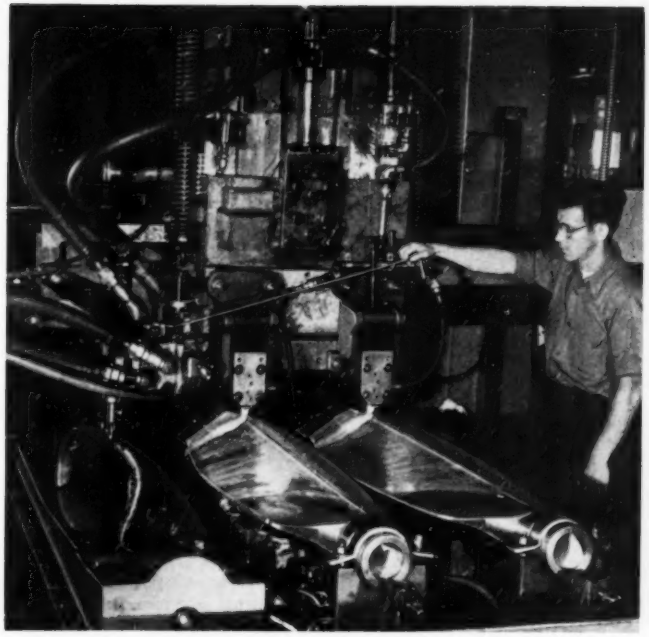




Reverse ring gears for Buick Dynaflow transmission are cut at 75 per hour on a rotary gear shaper with a diaphragm chuck doing the holding. Eight fingers clamp gear as bolted-down diaphragm plate is pulled by push rod. Gear has 79 teeth, 16 diametral pitch, 20° pressure angle, 15° 47′ 43″ helix angle, 5.1313-in. pitch dia., 1 3/16-in. face width

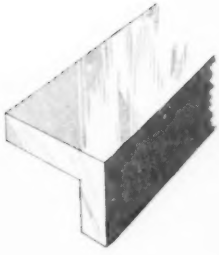


Cam track below roller attached to push rod controls diaphragm. Limit switches at track ends operate lights on control panel to indicate when chuck is closed. Operator only removes and replaces work when turret is in correct position. *Fellows Gear Shaper Co.*

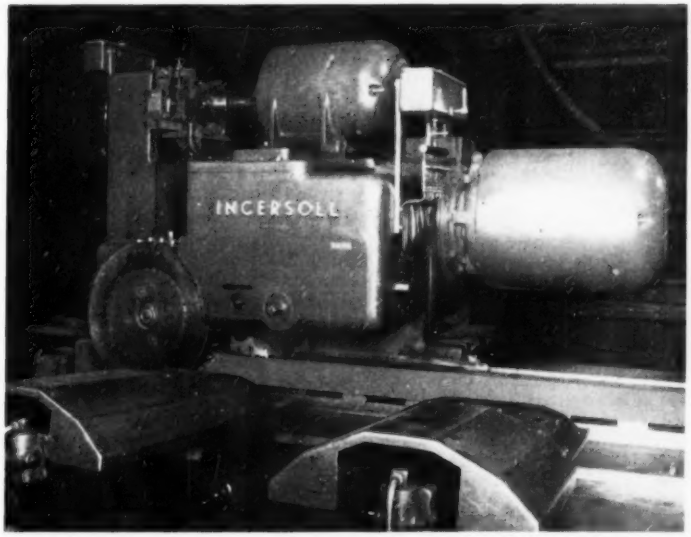


MAGNETIC CHUCKS HOLD PROPELLER BLADES

Steel propeller blades are contour planed on an open-side machine where Walker magnetic chucks grip the work. Large magnetic surface conforms to shape of blades, and thrust is taken by straps over propeller hubs. Two tools on double clapper-box setup follow roller riding on templet. *Aeroproducts Div., G.M.C.*



CARBIDE MILLING REPLACES GANG PLANING



Roller beams for cotton-spinning frames can be gang-planed, but carbide milling does a faster job and produces an extra-smooth finish. L-shaped cast-iron (Brinell 190) beams are hydraulically clamped in a special Ingersoll miller under two cutter heads—one vertical and one horizontal. Outside face and edge are machined in one 1-minute pass, then another pass finishes second side and edge. Depth of cut is ⅛ in. *Whitin Machine Works.*

TALKING SHOP

Radioactive Piston Rings

STANDARD OIL OF CALIF., through its subsidiary, the California Research Corp., and the Isotopes Division, Atomic Energy Commission, are cooperating in testing the effects of fuel and lubricants on engine wear by using radioactive piston rings. As little as a millionth of an ounce of metal worn from a ring can be detected by very simple methods—suggesting many another wear study.

G. E. has been "tagging certain atoms with radioactivity" to trace movement of atoms in metals. In silver, for example, atoms may move between grains as fast as 0.1 in. per week at 500C.—but going straight through a grain they take a thousand years to move the same distance. . . . There is really a practical objective here—to learn atom behavior (which determines metal characteristics) so metals may be "designed" for specific jobs.

Oleic Acid

ERNEST KANZLER, former WPB man in Detroit and now liaison man between Detroit auto men and the NSRB, has been likened to oleic acid, which Chas. F. Kettering explains "has a molecule which is soluble at one end in water and at the other in oil, thus making them mix as in milk." Apparently, our present need is for more oleic acid—between production and engineering, between management and labor, between industry and government.

Time-to-Pay Figures

THERE ARE some interesting time-to-pay calculations these days. For instance, the money saved by a new machine presumably goes into profit—so Uncle Sam takes a bite of 40% or so. Then how does one figure the time on which a new machine pays out—on the basis of full savings, or on full savings less 40%? . . . Or, again, costs of new tools are up about 40%, costs of the labor to operate them are up 120 to 130%, overhead up 150% or so. On that basis, a new tool can pay out in half the previous time or less.

Weatherometer

A WELL-EQUIPPED materials laboratory can handle many unexpected jobs. That at the Huntington Shops, C & O Railroad, test oils, paints and sand in addition to the expected metals and construction materials. One continuing test is on journal oils to maintain their "all-weather" characteristics so oil changes are not necessary to suit the season. This practice has practically eliminated hotboxes. Each carload is sampled and tested before acceptance—even though test results must be phoned 500 miles.

Sand for locomotive boxes is tested for assured braking. If too coarse or if it contains clay, it will clog sandbox discharge pipes; if too fine it blows off the rail before it serves its purpose.

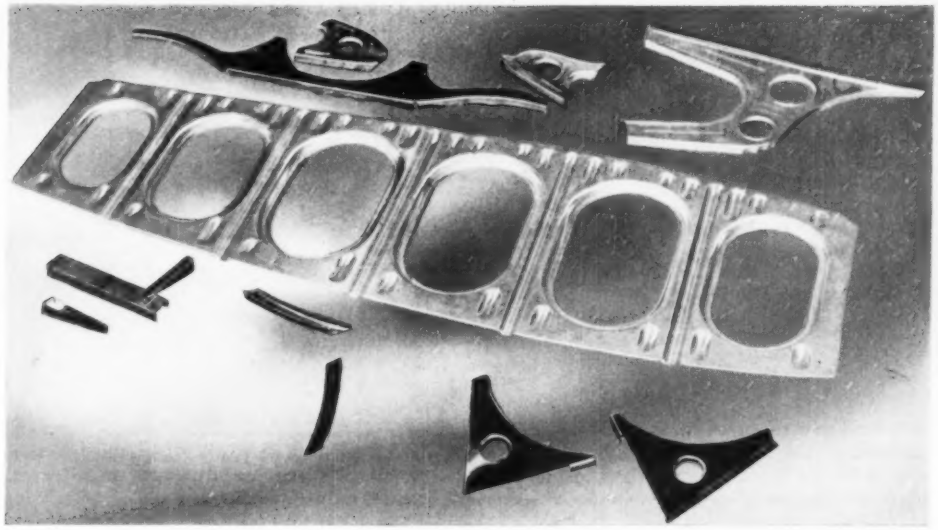
Paints for coaches, cars, locomotives, structures and buildings all are tested, even though bought to rigid specs from a regular supplier. Colors are tested by comparison with wet and dry standards in a refractometer; wearability by testing in one of two "weatherometers," which are special machines for accelerated weathering tests. One of the two has a fixed 15-min. cycle, in which panels are subjected to water spray, then exposed for drying and heating to a carbon-arc lamp. The other is a variable-cycle unit, normally used on a continuous basis of 3½ hr. wet-dry (spray, then arc), 3½ hr. rain spray, 16 hr. ultra-violet from the arc, then 1 hr. fast cooling with ice. With this setup, 500 hr. of test equals as much as 10 years' service on freight or passenger cars.

Daffynitions

INSTALLMENT PLAN: what keeps many animals from wearing their own coats. . . . ADDING MACHINE: what really counts in business . . . BORE: the fellow who keeps on talking when you're interrupting. . . . WINTER RESORT: where nobody knows how unimportant you are at home. . . . SECOND-STORY MAN: husband with two alibis. . . . USSR: Union of Silently Swallowed Republics. . . . HAPPY MEDIUM: successful fortune teller. MARRIAGE: what women try when wolf whistles get farther and farther apart. . . . SWEEPING REFORM: vacuum cleaner. . . . EDUCATION: what a chorus girl gets by stages, a college girl by degrees. . . . CHAPERONE: game warden . . . WOLF: a man who keeps a young lady pretty much in the dark. . . . CHRISTMAS: when father owes best.

Hot Paddle

HARRY GREENING, president of Hamilton (Ont.) Steel & Wire Co., has his eye on the Harmsworth Trophy. He's developing a paddle-wheel speed boat for the race, on the theory that slip will be less than 10%, as compared with 40% for conventional propellers, because at 100 mph., peripheral speed is less than 10,000 fpm., compared with 30,000 fpm. for propellers. Feature of the Greening design (G. M. Research cooperating) is narrow, long blades, set on the periphery of twin auto tires. Tires will take the shock of blade contact and eliminate complex feathering devices. Also to reduce shock, the outer blade edge is not flat, but brought to a center fin. . . . This may develop into a new type of shallow-water boat.



How to Rubber-Form Light Metals

BY R. BURT SCHULZE, Supervisor of Manufacturing Research, THE GLENN L. MARTIN CO.

FORMING with a rubber pad and a single hard punch or form block has long been the solution for occasional forming jobs, but it was in World War II that the aircraft industry developed the process into a major production method.

Rubber-pad forming is ideal for aluminum and magnesium when quantity is limited and parts are shallow. Die cost is a fraction of that for other methods and design changes are quickly and inexpensively made during production.

With widespread experience in rubber-pad forming during recent years, aircraft manufacturers have learned what can be done and how to do it. This information should be valuable to many outside the aircraft field who could profitably apply it to some of their own problems.

Present practice is comprehensively described in Mr. Schulze's book, "Aluminum and Magnesium Design and Fabrication," to be published in April by the McGraw-Hill Book Co., Inc. Parts of this book which deal with rubber-pad forming have been condensed to form this Special Report. The result is a complete, yet concise, account of how to take advantage of the rubber-pad forming process.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

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Rubber Forming Equipment

FORMING with a semifluid medium, such as rubber, involves a pad of the medium held in a retainer attached to the upper platen. The punch or form block is placed on the lower platen.

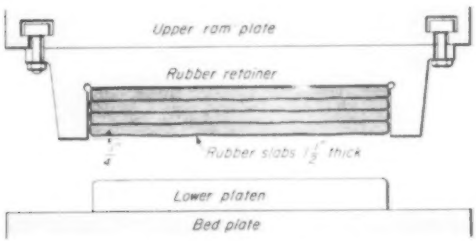
Rubber and Retainers

Rubber retainers are usually made of cast iron or steel. They are made thick and strong because the rubber acts like a fluid of high viscosity in that it exerts a tremendous force in all directions when compressed. To avoid stress concentration and cracking at the corners of the retainer, recessed fillets are often substituted for normal fillets. In addition, they do not interfere with the square-cut rubber slabs.

The rubber is put in the retainer in the form of a number of relatively thin slabs. The rubber is easier to handle in these thinner slabs, and an outer slab of rubber can be replaced when it has been worn severely, without losing the complete thickness of rubber.

Live natural rubber gives the best service, but the better grades of synthetic rubber give good results. The rubber is usually from 70 to 75 durometer hardness, although softer rubber is better in certain applications. The rubber slabs, slightly oversize in width and length, can be cemented in place in the retainer with a good grade of cement. The cement must be of such a nature that it will remain pliable and will not deteriorate the rubber.

Although almost any magnesium part that incorporates anything other than a straight bend at a rather generous bend radius must be formed hot, the forming can usually be accomplished at a temperature no higher than 400 F. Natural rubber of 60 durometer hardness will stand temperatures up to 450 F., but it becomes sticky at these higher temperatures. Ordinary waxed paper successfully prevents the parts from sticking to the rubber if it is placed over the material blanks and form blocks before forming. Certain special synthetic rubbers have been developed that will stand temperatures as high as 450 F. without becoming sticky, but they will not stand as much abuse as natural rubber.



Rubber retainer is of heavy construction. Interior corners are generally provided with recessed fillets

Directly under the rubber retainer is a lower platen mounted on the bedplate. The lower platen has beveled edges so that it will mate easily with the retainer when the retainer moves down. A clearance of 1/16 in. is allowed on each side between the platen and the inside of the retainer.

Loading Methods

Because it is difficult to load form blocks directly onto the platen when the press and retainers are large, various arrangements are resorted to that ease this difficulty. The most common consists of one or more loading tables, which are loaded with one or more form blocks outside of the press area and moved onto the bolster plate one at a time by a power drive.

As many as four loading tables can be used efficiently on a large press, although two loading tables are sufficient for most presses. Four tables are arranged so each table-top plate moves off one end of the platen when a power-driven chain is actuated. As it moves off the end of the press platen it rides over onto the body of the loading table. The complete loading table then moves to the side to make room for the other loading table to move in opposite the end of the press. This happens alternately on each end of the press.

When four loading tables are employed, the people loading any one table have three press-operating cycles in which to remove finished parts from the form blocks and put new blanks in place. Although each cycle of a large press consumes about $1\frac{1}{2}$ min., the people loading one table are usually kept busy while the parts on the other loading tables are being formed, as parts are sometimes difficult to remove.

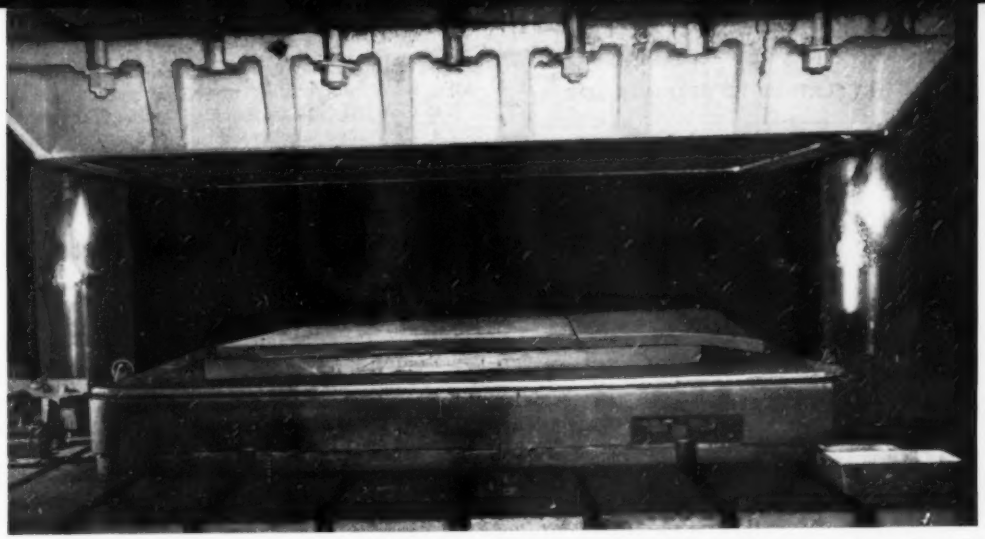
With two loading tables on one press, the operation is the same except that no sidewise motion is necessary after loading plate moves off the press.

Operating Pressure

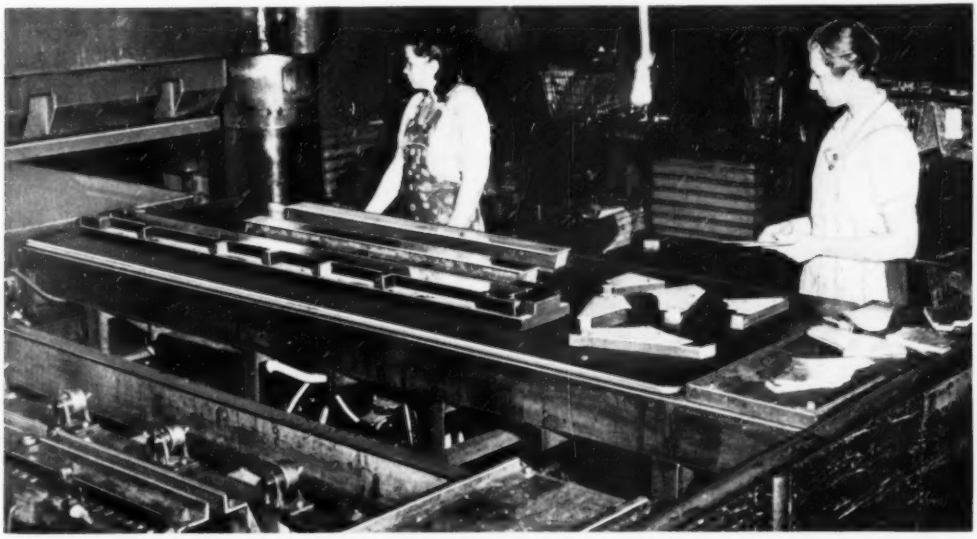
Although the total number of tons a press is capable of exerting on the ram is important, the pressure that is most important in rubber forming is the number of pounds per square inch developed within the retainer on the work. This is a function not only of the total number of tons available but also of the size of the retainer.

The theoretical number of pounds per square inch on the work equals the number of tons available times 2000, divided by the area of the retainer in square inches. Although forming work can be accomplished on thin gages of a relatively soft material at pressures of 400 or 500 psi., pressures as high as 2000 or 2100 psi. may be required for forming thicker gages of stronger materials, and 900 to 1000 psi. represents a satisfactory working pressure for the average job.

When a particular part demands a higher work-



Lower platen has beveled edges and is mounted to mate with rubber retainer as the press ram descends



Loaded table, with form blocks in place and blanks positioned on the form blocks, is ready to move onto the press bed. A second table (in the foreground) has been removed to show rollers and chain drive

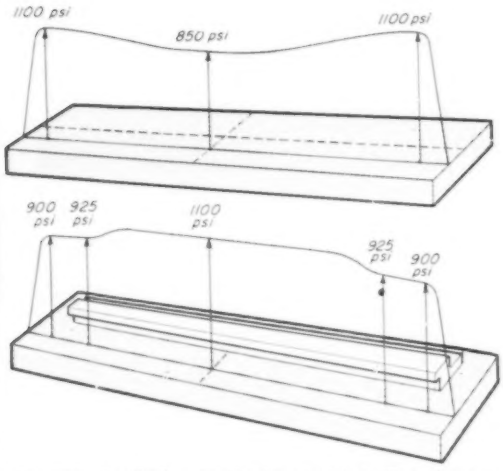
ing pressure than a standard-shape retainer will provide, a special retainer may be necessary. This enables the operator to concentrate the total pressure available on the part itself without wasting pressure on empty areas of a platen. However, retainers are rather expensive and special shapes should be supplied only where there is sufficient work of a given shape. Table 1, taken from the actual records of one company, shows the variation in theoretical psi. with variation in retainer size. Such a chart can be easily worked out for any given group of retainers on a given press.

Contrary to what would normally be expected, the unit pressure exerted by the rubber is not uniform throughout the area of the retainer. In fact, the unit pressure on various form blocks located at various places on the platen or loading-table top may be radically different.

Although the effect of the shape of the retainer itself is important, the tendencies are the same and the retainer shape illustrated is fairly typical. Pressures are higher toward each end when the rubber in the retainer is forced down against the platen with no form block in place. The lower pressure at

Table I
PRESSURE IN RELATION TO RETAINER SIZE

Retainer sizes, in.	Total operating pressure in tons								
	1,700	1,800	1,900	2,000	2,100	2,300	2,500	3,000	3,500
	Lb. per sq.in.								
13 by 110	2,380	2,520	2,660	2,800	2,994	3,220	3,430	4,200	4,960
29 by 74	1,585	1,680	1,775	1,865	1,960	2,145	2,330	2,790	3,310
29 by 111	1,038	1,100	1,160	1,220	1,283	1,405	1,529	1,835	2,170
54 by 70	900	953	1,005	1,059	1,100	1,216	1,320	1,588	1,880
38 by 110	812	860	908	955	1,002	1,100	1,195	1,433	1,695



Pressure distribution on the lower platen. Top diagram shows the distribution without form blocks and the lower diagram shows the effect of a single form block which reverses the pattern of pressure distribution

the middle of the platen is caused by the fact that more rubber squeezes out between the retainer and the platen at this point than at the end. This increased escape of rubber toward the middle of the platen follows approximately the shape of a catenary curve.

When a rectangular form block is placed on the platen the pressure distribution reverses itself. The lower pressure, which is now toward each end of the platen, is caused when the form block shape, or the pattern of a number of form blocks, is such that the empty volume below a plane passing across the top of the highest form block is greater toward the end of a platen than it is at the middle. The greater volume to be filled by the same amount of rubber naturally results in a reduced pressure area. This condition may be caused by the arrangement of a number of form blocks on the platen as well as by the shape of any one block.

The unequal pressure distribution is not very serious, except that it may result in parts that are not formed so well or completely as might be expected. The solution to the problem is simple. Additional rubber pads are cut out of sheets of rubber to fit the shape required. They can usually be obtained from old pieces of rubber taken out of the retainer when replaced or from odds and ends left over after cutting a new rubber blanket to fit a retainer. These additional throw pads are placed around or on top of the form block after the blank is in place.

Form Blocks

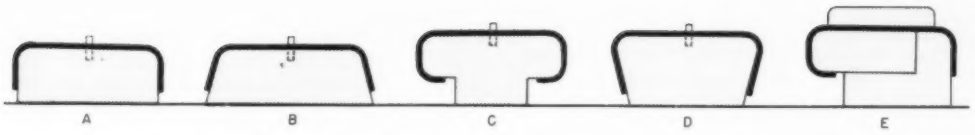
FORM BLOCKS can be made from a comparatively wide variety of materials. Masonite die stock or impregnated fiber will successfully stand the pressures in most cases and are relatively inexpensive. Masonite will break down rapidly, however, if the form block is made with sharp corners. Masonite is not suitable for blocks which have an overhanging section. In either of these cases or when a large number of parts is required, the form block should be made of steel.

Plastic form blocks have been attempted in a number of cases but they must be employed only with great care as they are likely to crack if they are made of material sufficiently hard to withstand the pressure without creeping. Plywood form blocks are seldom satisfactory because they will not stand the pressure.

Careful selection of form-block materials is necessary when hot-forming magnesium. Kirksite, for example, creeps somewhat at 450 F. Magnesium, aluminum, and steel are popular materials for form blocks. Magnesium is probably the most popular. It is easy to machine and the form blocks are light and easy to handle. Magnesium blocks also have the same heat coefficient of expansion as the material being formed.

In the interest of long rubber life, form blocks should be kept as low as possible and all corners that the rubber must flow down over should be rounded off as much as the part will permit. High flanges cannot be formed, regardless of the form block limitations, and most designs do not require high flanges anyway, so most form blocks are 1 to 1½ in. high. Such form blocks cause little deterioration of the rubber.

Occasional form blocks can be made as high as 3 in. without seriously impairing a 6½-in. depth of rubber, but the designer should be careful to round off the corners of such form blocks as much as possible. When calculating the height of form block necessary to form a particular part, consideration must be given to the fact that rubber will not form itself into sharp internal recesses or corners. For example, it will not form itself into the sharp 90° corner between the side of the form block and the bolster plate on which the form block rests but will form a natural radius between the two surfaces. Additional height must be added to the form block so that the bottom edge of the formed flange will be higher than the tangency point of this natural radius formed by the rubber. This means that the form-block height must be ⅛ or 3/16 in. higher than the greatest height of the part.



Part removal is influenced by form-block design. Work with flanges at 90° (A) or greater (B) can always be removed easily. In case C, with a second angle on the flange, the part cannot be removed unless the locating pins are removable and then only with difficulty. Parts like D can be removed if the part is light-gage and the angle is only slightly closed, but only with loss of time and possible injury to the operator's fingers. When a return flange is essential more expensive tooling, as at E, can be employed to permit part removal. The block above the work is to prevent marring of the flat surface by the rubber at the high pressure required

Locating Pins

When material blanks are placed on the form block, they must be accurately located to prevent the blank from shifting out of position. Locating pins, for this purpose, are embedded in the form block so they project vertically up out of the top surface of the block.

Two or more pins are always provided so that the blank will not rotate around any one pin. However, two pins are generally best because of the difficulty of fitting the blank over a greater number of pins. Holes are drilled or punched in the material blank from which the part is to be formed in such positions that they match the locations of the pins in the block. The pins are 3/16 to 1/4 in. in diameter and are made of a good grade of steel.

The pin must be as short as is practical to avoid undue damage to the rubber forming blanket but high enough to properly locate the metal blank even though the blank may be warped from heat-treatment. A projection of 3/8 in. above the block is generally considered a good working height. Locations of the pins in the block should not be too symmetrical, or an almost symmetrical blank could be put on the block in the wrong manner.

When pins are required to have excessive height for some unusual reason, a small rubber throw pad is placed over the pin area of the part whether or not it is required for extra pressure. This rubber throw pad covers the pins as well as the part and the block and protects the main rubber blankets in the retainer from damage.

Springback

Parts formed with rubber pads typically have the majority of the metal in one relatively flat base plane with flanges and other formed shapes of various descriptions off that base plane. Forming is normally all in one direction from base plane.

Straight bends can be made at a slightly smaller radius for the same gage and material than is possible on the non-bottoming type of brake die. This is because the rubber supports the bend similar to a bottoming brake die. However, the difference in bend radii is so small that the same bend radii may be applied with either method.

Springback can be avoided in non-bottoming tooling for brake forming because the operator can run the brake punch down a little farther if the first stroke does not bend the part to the desired angle. More attention must be paid to the springback problem when forming with rubber as the main ram of the hydropress is bottomed on each stroke and no adjustment can be made for springback.

Springback is the elastic recovery of the part after the forming load has been removed. This elastic recovery depends on the material and the condition of the material. In general, the harder the material or material condition, the greater the springback. For example, 24S-T will spring back more than 24S-W, and 24S-W will spring back more than 24S-O. In a similar manner, 75S-T will spring back more than 24S-T, since 75S-T is the harder material. Magnesium alloys formed cold perform in a similar manner to an equivalent aluminum alloy, but hot-forming magnesium alloys will greatly reduce the resulting springback.

One way to avoid springback is with a softer condition of the material. For example, 24S-O could be substituted for 24S-T. Although 24S-O would form satisfactorily and would be within tolerances, the engineering drawing might require the final part to have the strength of 24S-T. The part would therefore have to be heat-treated to the T condition after the forming operation was completed. This would be all right for short parts, especially those of heavy gage. However, the heat-treating operation includes cold-water quenching that tends to set up severe residual stresses in the metal. The warpage and distortion resulting in a part are not apparent in a short length but when the part is long or when it contains a large, flat unstiffened area, the distortion from heat-treating is severe. In many cases it is greater than the effect of springback when the part is formed in the T condition.

Distorted parts with a constant cross-sectional shape can often be straightened by the stretch-straightening process. Both excessive springback and distortion can often be avoided by heat-treating the part and then roller-leveling it before forming.

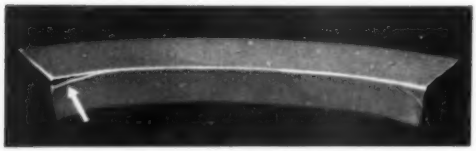
A roller-leveling machine consists essentially of two banks of rolls arranged in such a manner that a sheet of metal is cold-worked as it passes between the two banks. This cold working is sufficient to remove the strains so that the sheet is flat when it emerges from the other side. Some alloys stay soft for a time after heat-treating. They can be roller-leveled and formed immediately after heat treatment. If these operations do not take too much time,

the work will have relatively little springback, yet harden to meet the required tolerances.

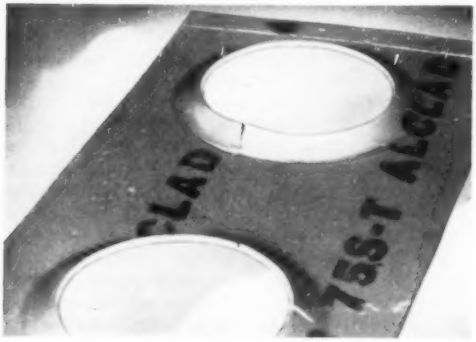
When plants are not equipped with heat-treating facilities, they must form the part in the T condition when the finished part must be T material. In addition, because material purchased in the T condition is cheaper than that bought in the O condition and then heat-treated in the fabricator's plant, it is sometimes advisable to form the part in the T condition. In either of these cases, springback is avoided by the tooling employed for the job.

The gage of material formed has a strong influence on the degree of springback encountered in forming any particular part over a particular radius. The ratio of permanent set to elastic recovery is greater on thick material than it is on thin material. Therefore, the thicker the material, the less it will spring back, proportionately, for any given forming operation. In a like manner, the amount of springback encountered forming over a sharp radius is proportionately less that the springback encountered in forming over a large radius.

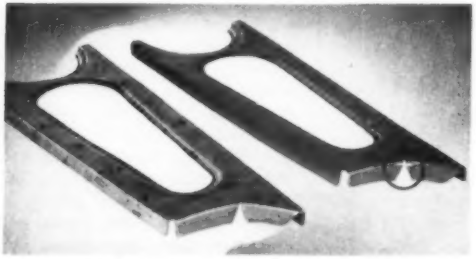
Forming Procedure



Curved flanges include a stretch flange on the near side of this part and a shrink flange on the far side. Failure of the stretch flange resulted from the friction drag of the rubber although bend radius was adequate



Lightening-hole flanges at 55° angle. These flanges show radial cracks, one of which has continued along the bend line because the bend radius was too small.



J-flange reinforcements around the cutout are generally made in two operations with an insert for the second operation. Notch in stretch flange at front caused stress concentration which was not enough to crack 24S-O (left) but did crack R301-W (right)

CURVED flanges are of two distinct types—stretch flanges and shrink flanges. Although the bend radii for straight flanges can be applied on both stretch- and shrink-curved flanges, for best results the bend radius is increased to about 1¼ times that for straight flanges.

The stretch flange can always be distinguished by the fact that the plan-view radius to the edge of the flat blank is less than the plan-view radius of the finish-formed flange. In this case the material must elongate to assume the longer length required of it in the finish-formed position. The shrink flange is just the opposite.

Stretch Flanges

Although stretch flanges nearly always fail by cracking radially when the elongation exceeds a permissible amount, they also will crack along the bend line of the flange under certain circumstances.

In some cases, the part is subjected to enough friction of the rubber as it drags down along the flange to cause the part to tear along the bend line even with the proper bend radius.

When too small a bend radius is attempted, radial cracks in stretch flanges may continue along the bend line. Notches are another factor that may cause a stretch flange to fail along the bend rather than radially. Although there are cases where it is wise to notch a flange to assist it to form properly, this should not be done where the flange is under a severe stretching stress.

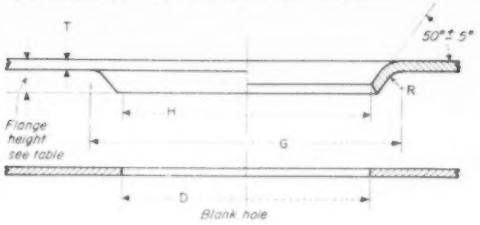
Normal stretch-flange design is based on the maximum practical elongation of the material at the edge of the flange. Most curved flanges are formed when the material is in either the O or the W condition and data is usually based on these conditions rather than the T condition. The following formula is based on the elongation factor:

$$\frac{R - H}{R} = \text{or} > 0.89$$

where R = true formed radius of flange contour
H = height of flange.

This formula can be followed rigidly with the right type of equipment. However, rubber-pad forming places certain limitations on this formula.

Table II
LIGHTENING HOLES FOR 55° FLANGE



D	H	G	T	R
		½ Flange Height		
0.445	0.812	1.223	0.020–0.040	3/16
0.490		1.272	0.051–0.072	1/4
0.570	0.938	1.348	0.020–0.040	3/16
0.525		1.337	0.051–0.072	1/4
0.695	1.062	1.473	0.020–0.040	3/16
0.650		1.462	0.051–0.072	1/4
0.820	1.188	1.598	0.020–0.040	3/16
0.775		1.587	0.051–0.072	1/4
		5/8 Flange Height		
0.980	1.312	1.800	0.020–0.040	3/16
0.852		1.791	0.051–0.072	1/4
1.150	1.562	2.050	0.020–0.040	3/16
1.082		2.041	0.051–0.072	1/4
1.276	1.688	2.175	0.020–0.040	3/16
1.208		2.166	0.051–0.072	1/4
1.400	1.812	2.300	0.020–0.040	3/16
1.332		2.291	0.051–0.072	1/4
		3/4 Flange Height		
1.606	2.062	2.625	0.020–0.040	3/16
1.543		2.617	0.051–0.072	1/4
1.490		2.611	0.081–0.102	5/16
1.856		2.875	0.020–0.040	3/16
1.793	2.312	2.867	0.051–0.072	1/4
1.740		2.861	0.081–0.102	5/16
1.982		3.000	0.020–0.040	3/16
1.919	2.438	2.992	0.051–0.072	1/4
1.866		2.987	0.081–0.102	5/16
2.106		3.125	0.020–0.040	3/16
2.043	2.562	3.117	0.051–0.072	1/4
1.990		3.111	0.081–0.102	5/16
2.356		3.375	0.020–0.040	3/16
2.293	2.812	3.367	0.051–0.072	1/4
2.240		3.361	0.081–0.102	5/16
2.606		3.625	0.020–0.040	3/16
2.543	3.062	3.617	0.051–0.072	1/4
2.490		3.611	0.081–0.102	5/16
2.856		3.875	0.020–0.040	3/16
2.793	3.312	3.867	0.051–0.072	1/4
2.740		3.861	0.081–0.102	5/16
3.106		4.125	0.020–0.040	3/16
3.043	3.562	4.117	0.051–0.072	1/4
2.990		4.111	0.081–0.102	5/16
3.356		4.375	0.020–0.040	3/16
3.293	3.812	4.367	0.051–0.072	1/4
3.240		4.361	0.081–0.102	5/16
3.606		4.625	0.020–0.040	3/16
3.543	4.062	4.617	0.051–0.072	1/4
3.490		4.611	0.081–0.102	5/16
3.856		4.875	0.020–0.040	3/16
3.793	4.312	4.867	0.051–0.072	1/4
3.740		4.861	0.081–0.102	5/16

These lightening holes may be formed in 52S-H32, 61S-T, 24S-T, 14S-T, R-301-T, and 75S-T aluminum alloy and AMG52SO and FS-h magnesium alloy or any softer condition of any of these alloys.

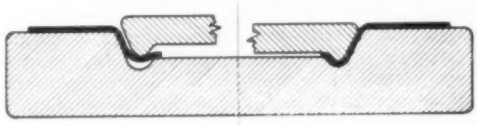
The thickness of the rubber pad limits the flange height that can be formed. After limitations for radical cases are taken into account, the formula can be applied. Essentially it means that the material must not be stretched more than 11%. This is close to the allowable practical elongation in most aluminum aloys. The same figure will hold for magnesium alloys providing they are heated to about 400 F.

Certain special types of stretch flanges, other than the most common and simple 90° flanges, have been given considerable attention because they serve well for stiffening purposes. Such a special flange is the "55° lightening-hole flange." This is formed down about 55° from the main plane of the part and its usual purpose is to stiffen round lightening holes. Such flanges have been worked out for a number of materials and gages. The forming of these flanges is based on a variation of the formula (R – H)/R, which takes care of the difference between the approximately 55° angle and the normal 90° angle. Similar flanges will stiffen noncircular holes and cutouts in the edge of the sheet.

The J-flange is another popular type. J-flange limitations are also based on another variation of (R – H)/R, which takes care of the change in angle and the change in shape.

J-flange forming is typical of the operations in which inserts are of advantage. Inserts always require a second operation. Th first operation is performed in rubber alone in the normal manner. This provides enough of an impression to enable the insert to be located readily. In the second operation the insert accumulates the rubber pressure exerted on the whole area of the top surface of the insert and bridges it over so that this total pressure forces the flange down into its final position.

Another type of stretch flange is really a means of interrupting a 90° flange. The transition between the 90° flange and the flat must be over enough distance that the length of the curved edge does not exceed the transition length by more than 11%.

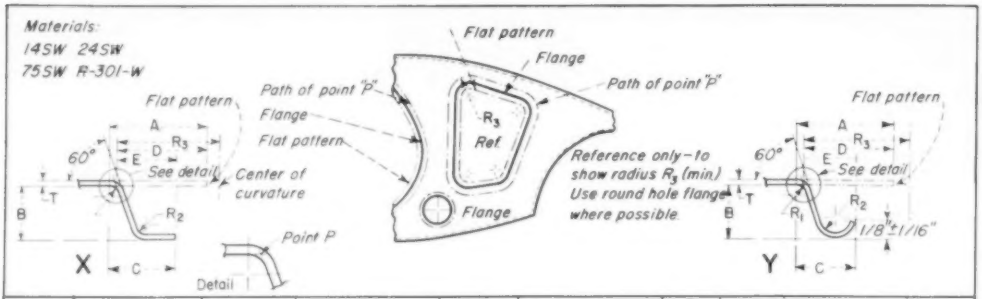


Inserts require two operations. First work is formed with rubber pad. The insert is placed in the impression (left) and the second stroke completes the forming

Shrink Flanges

Shrink flanges, as contrasted to stretch flanges, nearly always fail by crippling locally so that wrinkles form. The forming mechanism, in order to form a particular shrink flange successfully, must successfully resist this tendency of the flange to wrinkle rather than shrink as it reduces in length to assume its final position. Steel tools, for example, offer sufficient local rigidity to enable very severe shrink flanges to be formed smoothly, but rubber does not offer this local rigidity. In fact, rubber in itself will not form an absolutely perfect shrink flange regardless of the radius or flange height. However, many combinations of radius and flange height can be formed where the resulting wrinkles are so low and so infrequent that they are either not objectionable without further treatment or can be hand-worked out with little difficulty.

Table III ALLOWABLE SIZES OF J FLANGES



	A (Ref.)	B ± 1/8"	C (Ref.)	D	E (Ref.)	T (Max.)	R_1	R_2		R_3 (Min.)
X	51/64	9/32	45/64 ± 5/64	.655	9/16 ± 5/64	.051	1/4	1/4	To 7/16 max.	1-3/4
	1-1/8	9/16	7/8 ± 1/8	63/64	47/64 ± 1/8	.051	1/4	1/4	To 5/8 max.	3-1/2
	1-7/32	3/4	15/16 ± 3/16	1-11/64	57/64 ± 3/16	.051	3/32	5/32	To 1" max.	5

	A (Ref.)	B ± 1/16	C (Ref.)	D	E (Ref.)	T (Max.)	R_1	R_2	R_3 Min.	R_3 Round hole	Dash numbers				
									-1	-2	-3	-4	-5	-6	-7	-8
Y	35/64	3/16	29/64	31/64	25/64	.051	3/32	5/32	1-3/8	1-5/8	1-7/8	2-1/8	2-3/8	2-5/8	2-7/8	3-3/8
	5/8	1/4	1/2	9/16	7/16	.051	3/32	5/32	1-3/4	2	2-1/4	2-1/2	2-3/4	3	3-1/2	4
	11/16	1/4	19/32	37/64	31/64	.072	3/16	3/16	1-1/2	1-3/4	2	2-1/4	2-1/2	2-3/4	3-1/4	3-3/4
	49/64	3/8	37/64	45/64	33/64	.051	3/32	5/32	2-3/8	2-5/8	2-7/8	3-3/8				
	63/64	9/16	43/64	59/64	39/64	.051	3/32	5/32	3-5/8	4-1/8						
	1-13/64	3/4	25/32	1-9/64	23/32	.051	3/32	5/32	5							

← (For round holes only) →

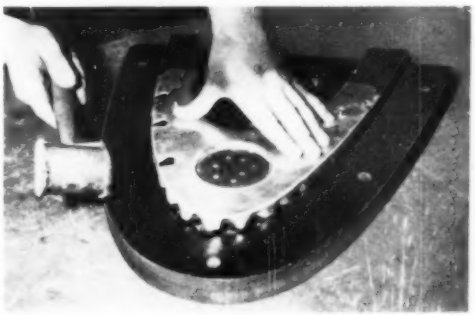
It is possible to form a perfect shrink flange for certain distances at the expense of deliberately forming wrinkles (called flutes) of predetermined regular shapes at regular intervals. Flutes, in other words, are regularly shaped wrinkles deliberately placed at predetermined positions so that rivets or other fasteners can be located in advance with full assurance that the flange will be absolutely smooth at the positions the fasteners will occupy.

Even fluted flanges do not always form perfectly in rubber. In such cases the parts are put back on the form block and finished by hand.

Other designs than flutes have been contrived for displacing the metal in a shrink flange, some of which are very good. However, care should be exercised to avoid a curved rivet pattern.

It is sometimes desirable to notch the flange rather than put flutes in it. This is especially true when notches must be provided anyway for members that pass through the part containing the shrink flange. If this is true, notches are satisfactory if they fall at the same spacing at which flutes would otherwise have to be placed. However, if it is desired for a particular job, notches can even be spaced a little farther apart than flutes, as it is a little easier to hand-work the wrinkles out of a notched flange than it is to hand-work them out of a fluted flange.

When a perfect shrink flange is desired without notches, flutes, or subsequent hand work, it must be made by using a steel tool. A little money can still be saved by using a combination of a steel tool and rubber, since the rubber eliminates one pressure pad normally required with the steel tool.

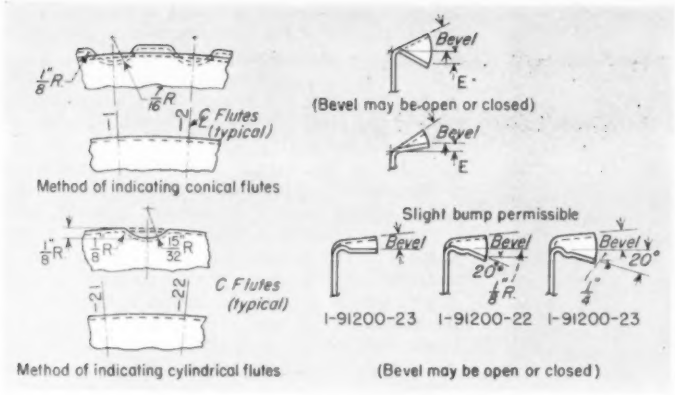


Imperfect flutes are finished by hand with the part on the form block

A Z-section, or any other section in which two or more flanges must be formed in opposite directions from the web of the part, is more difficult to form in rubber than a part in which this is not the case. In fact, such parts must usually be formed in two operations on two separate form blocks.

Beads

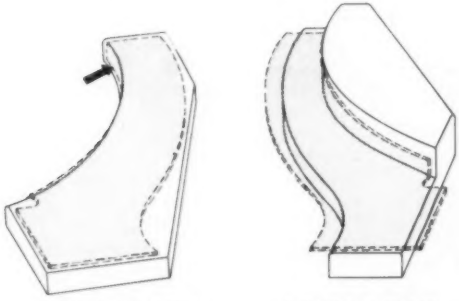
Beads that run the entire width or length of a sheet, can be formed to considerable depth in a press brake because the metal can readily move into



Flute spacing depends on radius of curvature of contour and bevel angle. For closed bevel angles, spacing should be smaller, otherwise it is (1) 1-5/16 to 1¾ in. for radii up to 18 in. (2) 1¾ in. for 19-in. radii increasing by straight-line progression to 6 in. for 60-in. radii. (3) 12 in. for radii over 60 in. These spacings apply primarily to 24S-O but will apply to other materials of equal hardness. Spacing should be closer for harder materials and wider for softer materials

the bead depression. In most instances, however, stiffening beads are required in locations where they must terminate short of the edge of the sheet. In such cases, the metal beyond the end of the bead prevents unrestricted flow into the bead impression so that the maximum depth of the bead is more restricted. The increase in the area of the surface of the formed bead over the area of the original flat metal in the bead location must now be obtained almost entirely by elongation of the metal in and around the bead area.

Such "locked-in" beads may be either straight or curved and any required length. Proportions are

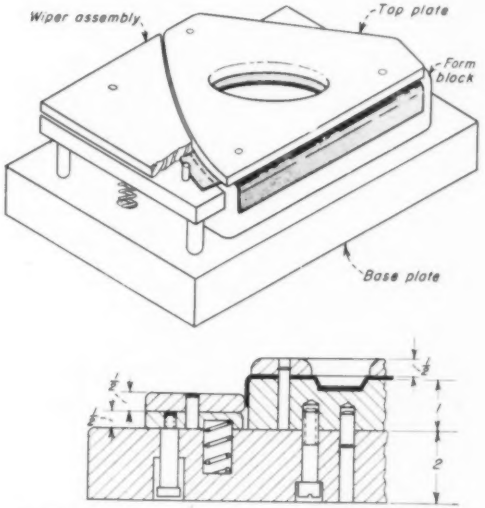


First operation block forms one flange as shown.

Part is then turned over and placed in second operation block.

Protective block is then placed in position to prevent rubber from harming flange already formed as rubber forms remaining two flanges.

Z-section must be formed in two operations on separate dies, because rubber will only bend work down



Combination die to form a perfect shrink flange without notches, flutes, or hand work

given in Table IV. The depth dimension can usually be held to a tolerance of ± 1/32 in. Any intermediate or greater sizes may also be formed providing the same proportions between the various dimensions are maintained.

These beads may be formed in aluminum alloys 2S-O, 2S-H12, 3S-O, 3S-H12, 14S-O, 14S-W, R301-O R301-W, 17S-O, 17S-W, 24-SO, 24-SW, 52S-O, 52S-H32, 61S-O, 61S-W, 75S-O and 75S-W. (W refers to as-quenched condition.) They may also be formed in annealed steels and in all magnesium alloys provided the magnesium is 300 to 400 F.

Three factors must be considered in determining whether or not any particular bead design will form or crack because of excessive elongation.

The first factor to be considered is the permissible elongation of the material, material alloy, or material condition.

The second factor is the distance between two or more beads or between a bead and some other formed shape in the same sheet. This is important because elongation of the metal in forming a bead is not confined to the exact area of the bead but also occurs in the adjacent area. If two beads are formed so close together that their respective areas of elongation overlap, the elongation available for each single bead will be reduced. Under ordinary conditions, metal will elongate on each side of a bead a distance equal to about half the width of the bead. However, since it is often desirable to place beads closer together than this would allow, the severity of forming of the beads in the table has been reduced so that these beads can safely be placed so the distance between center lines is as little as eight times the depth of the bead.

The third factor in determining whether a particular bead will form or crack is the success with which local elongation concentrations are prevented. If the required total elongation can be used to develop evenly over as wide an area as possible, the part will form successfully. But if some local condition prevents the elongation from developing evenly, the part will locally elongate excessively and crack. Excessive local elongation can be caused by using radii that are too sharp at the edges of the bead impression. These radii, when sharp, have the effect of locking the material and confining the elongation. Therefore the radii at the edges of the beads in the table are considerably larger than the ordinary bend radii. However, the worst offender in locking the material is a poor surface condition on the form block itself.

Addition of a lubricant provides the effect of an infinitely smooth block and enables the beads to be formed deeper than indicated in the table. Glycerin or paraffin are good lubricants because they are cheap, are easily applied and removed, are not objectionable to the operator, and do not hurt the rubber. Glycerin is probably the better.

Although paraffin and glycerin have been mentioned in connection with the forming of locked-in beads, they can be used on a great many rubber-pad forming operations to advantage. In fact, they can be used wherever greater elongation is required than can be obtained without lubricant. Although these lubricants can be applied and removed easily and are not messy to handle, they should be applied only where necessary, as their use involves two extra operations.

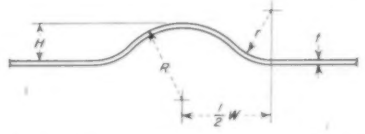
The bead impressions are placed in any flat form block by an end mill on a vertical milling machine. The end of the end mill is shaped to cut the complete bead impression in one pass.

A parabolic end to beads (in the plan view) is better from the forming standpoint in that it tapers off gradualy the severity of the forming required. However, it requires more difficult work in making the form block itself. The parabolic end requires that the end mill be gradually withdrawn from the form block so that it cuts a lesser and lesser depth until it finally clears the surface of the block. As the end mill is raised the shoulder leaves the block immediately, so that the radius is not automatically cut around the end of the bead impression. This radius must then be put on the block by hand.

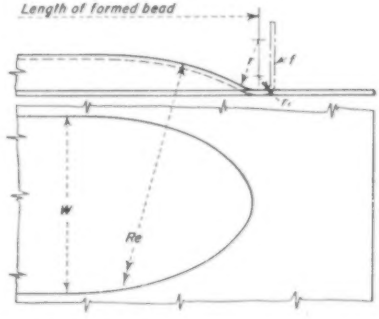
This difficulty in cutting the end of the impression in the form block can be avoided by simply raising the end mill directly out of the form block after arresting its forward progress. Not only does this simplify the operation of the milling machine but it also allows the end mill to cut the radius completely around the bead impression. However, it increases the severity of forming. The beads defined in the table can be formed as specified with circular ends with one exception: Beads with parabolic ends can be formed so that the radius is tangent with the radius at the base of an adjacent flange, but beads with circular ends must be stopped at least ½ in. from the tangency point of a flange radius.

Beads can be arranged in a multitude of patterns, with each pattern offering an advantage in its particular case. For example, a number of beads can be arranged immediately adjacent to each other so

Table IV
ALLOWABLE SIZES OF LOCKED-IN BEADS



Bead No.	H	½ W	R	r	Re	Suitable gages
−1	.050	1/8	7/64	.070	1/2	.020
−2	.100	1/4	7/32	.140	1	.020−.025
−3	.150	3/8	21/64	.210	1 1/2	.020−.032
−4	.200	1/2	7/16	.280	2	.020−.040
−5	.250	5/8	35/64	.350	2 1/2	.020−.051
−6	.300	3/4	21/32	.420	3	.020−.064
−7	.350	7/8	49/64	.490	3 1/2	.020−.064
−8	.400	1	7/8	.560	4	.020−.064



Tolerances: End location ± 1/16
Bead depth + 1/16 − 1/32

Note: Beads may be either straight or curved and may be any required length. Suitable gages based on hydropress pressures from 800 to 1200 pounds per square inch.

that they form a shallow, but effective, corrugation.

When a bead-type corrugation is bent around a corner the valleys in the one portion are opposite the crests in the other portion. Beads are put in on one form block and the bend on a second form block. The critical part of the operation is to make the two form blocks in such a manner that the amount of metal along the two bend lines is the same on both the first- and second-operation blocks.

The standard beads on which dimensions have been given can be arranged in an almost infinite variety of patterns. An efficient design is the "waffle-bead panel." It consists of a formed sheet and a flat sheet which are spot welded together. Waffle-bead patterns can be varied considerably. In fact, flat areas can be left to receive fittings.

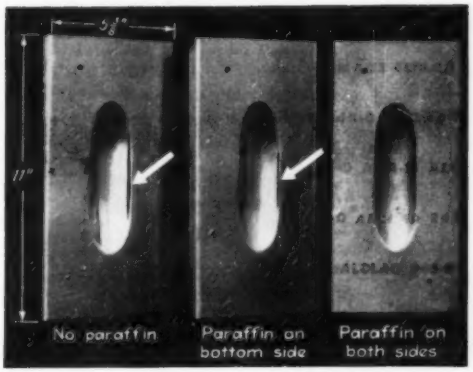
Perseverance will often prove that a shape at first thought impossible is really possible and a series of pieces should be attempted before a desired design is discarded. The series of pictures of attempts at a waffle bead on a hatch panel show how experimenting with blank and pressure can result in success.

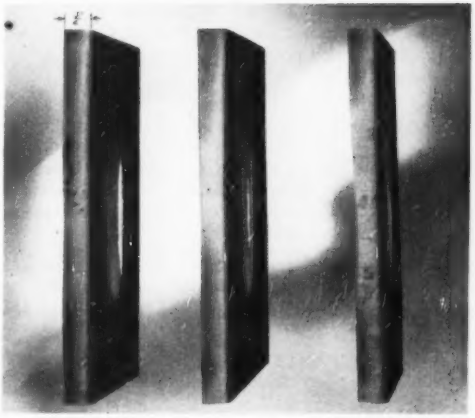
In certain applications of the general waffle-bead idea, it is desirable to incorporate one oversize bead, which will take care of a heavy load in one plane through the panel. The large bead is formed first.

In one method of accomplishing the job, the large bead is formed in a separate first operation on a press brake. There is then no limitation on the height of the bead that can be formed on the brake. However, the part must be put on the second-operation form block and formed in a hydraulic press. The height of the large bead is thus limited to the height that can be accommodated in the rubber pad. The basic portion of the form block is usually at least 1 in. thick and the rubber in retainers is seldom thicker than 7 in., so the large bead is actaully limited in height to a maximum of about 3 in. This prevents it from penetrating into the rubber more than about 60% of the thickness of the rubber—a necessary limit for reasonable rubber life.

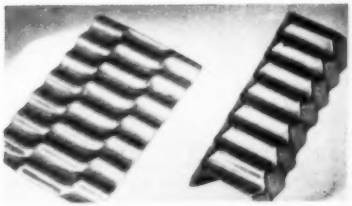
When the large bead is formed in the same operation in which the waffle bead is formed, the maximum height of the large bead should be held to approximately 1½ in. This limitation is necessary because of the practical limitation on the thickness of the necessary soft-rubber blanket required so the material will be folded down around the projection on the block and drawn into the proper position before excessive rubber pressure develops.

One precaution must be observed in the design of various bead patterns: The full strength of either bead is not obtained where two beads cross each other. Two intersecting beads normally fail at their intersecting point when tested. This difficulty can be alleviated in several ways. One patent application describes a "wave form" method in which the beads are formed deeper at the intersection than at any other point. This method is quite successful and costs little extra, since the only requirement is that the form block be reworked slightly.

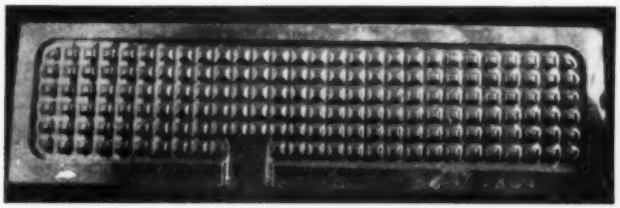




Lubricant is effective in forming beads. These specimens were formed on a Masonite block. Side views of the specimens shows how metal was drawn in when lubricant was applied



Bead corrugation bent around a corner. Center valleys are opposite outer crests



Waffle-bead panel cracked on the first attempt but was formed successfully when pressure was adjusted properly

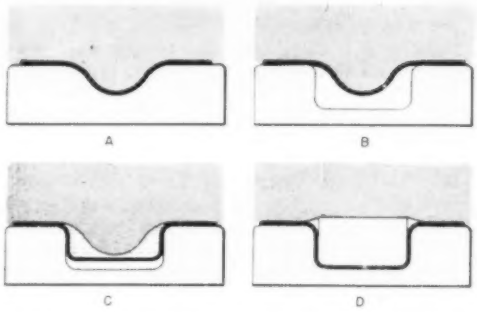
Drawing Procedure

SOME of the beads previously described were formed with paraffin as a lubricant, which allowed the material to flow into the die impression. The forming accomplished was not based on the elongation of the material alone but was assisted by additional material provided in the cavity by a reduction in the over-all area of the final blank. The formed part is said to be a "draw" part when such a condition exists.

The maximum depth to which these beads were drawn could have been increased by decreasing the area of the blank. This would have reduced the resistance of the metal in the blank to flowing into the cavity. Cutting off material from the blank at the ends of the bead would have accomplished more in this respect than cutting off material at the sides of the bead because the material at the ends acts as a beam, which prevents material at the sides from flowing into the cavity.

The rubber itself places a strict limitation on the amount a part can be drawn, regardless of the area of the blank used. The rubber forms a smooth arc as it attempts to fill a cavity and does not necessarily conform to the shape of the cavity. This resistance to assuming the shape of a cavity is due to the strength of the rubber itself.

Certain auxiliary means can be employed to assist the rubber to form metal into a sharp cavity. The impression in the metal can be sharpened up by using water between the rubber and the metal. In order to accomplish this, the part is placed on the form block and formed in the ordinary manner by means of the rubber only. The part is then allowed to remain on the form block and water is poured into the cavity in the metal until the water almost fills the cavity. The rubber is then forced down against the part again and the water is sealed in the cavity by the rubber around the periphery.

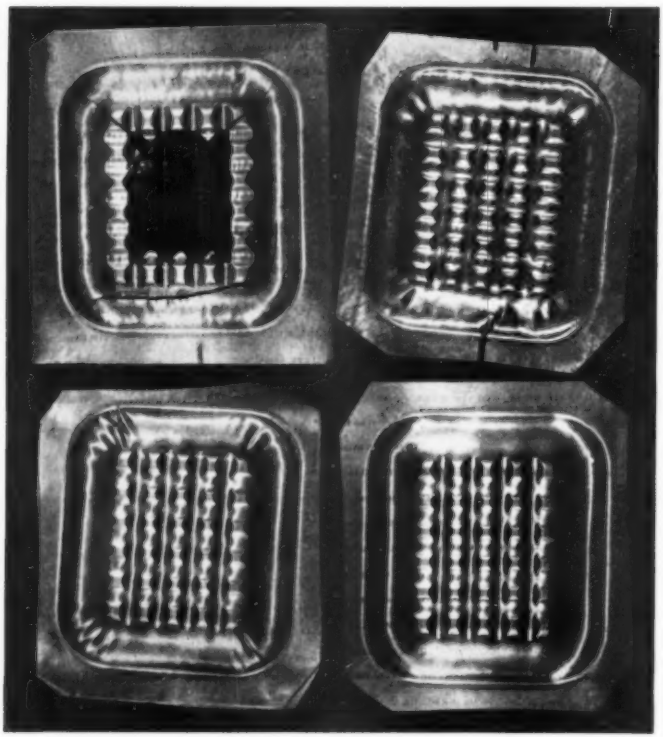


Rubber in deep cavities: (a) Rubber pad forms typical bead shape. (b) Rubber takes approximately the same shape regardless of how much the cavity is deepened and sharpened. (c) Water in the cavity formed on a first operation improves results on a second operation. (d) Hard insert on the second operation brings part to exact shape required

The water does not resist any change in its shape, as does the rubber, and the corners will be formed a little sharper and the part will be formed a little deeper than by rubber alone. This effect can be enhanced by placing additional rubber throw pads over the water before the second forming operation.

Although water will help to form some parts that cannot be formed in rubber alone, the water does not help a great deal and its use should be employed only where the rubber will almost do the job alone.

Another method is to place a hard insert of Masonite, cloth-laminated plastic, cast Kirksite, or



Four attempts show the value of perseverance. This hatch panel cracked wide open on the first attempt. Slight variations in blank and pressure were made with improvement each time. The last part is almost perfect

even steel in the impression before the second operation. Rubber throw pads can be cut to fit in the cavity and serve instead of hard inserts where radii required are more generous.

Such inserts will bring the corners to the exact shape required. These inserts will also increase the depth of draw obtained. They increase in effectiveness as the width of the cavity increases, because no pressure is required to form the flat bottom of the part and the insert can bridge the pressure of the rubber exerted on the whole plan-view area of the part over to the side walls, where it is needed. As a rule, an insert will bottom a cup when the width-to-height ratio is as great as 4 to 1.

A typical case of a draw attempted by the rubber-pad method is an oil-drip pan. When the metal was locked and the rubber attempted to push it on down into the cavity, the excess material in the flange could not move into the corner radius as it would in a normal draw. The amount of metal required to fit the radius was greater than the original material plus its maximum elongation, causing the part to crack. The crack occurred almost continuously in the radius around all four sides of the pan, because locking the metal prevented a crack on one side from relieving a stress on the other side of the pan. This type of failure is typical of parts locked by rubber.

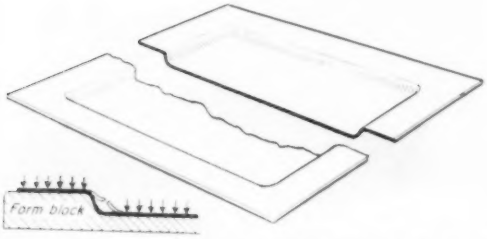
Only a short flange is actually required on this pan and the condition could be alleviated by cutting off some of the excess material of the flange so that the rubber would not have so much chance to grip it. Care would have to be exercised, however, not to remove so much material that the rubber could not exert enough pressure to iron out the wrinkles.

In cases where a wide flange is required without wrinkles, the flange can be protected from too much friction from the rubber by a coating of paraffin, as previously discussed, or by means of an undercut protecting block.

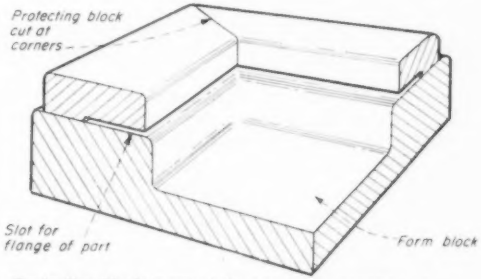
If this protecting block is necessary around the complete flange of the pan, it should be cut at the corners so that each side is an individual piece. If this is not done, stresses at the corners will cause it to break. Careful design of the protecting block is essential. When the base is increased at the expense of the undercut, the rubber exerts more pressure to hold the protecting block firmly against the form block and less pressure to hold the protecting block firmly against the flange of the blank.

On the other hand, when the undercut is increased at the expense of the base, the opposite is

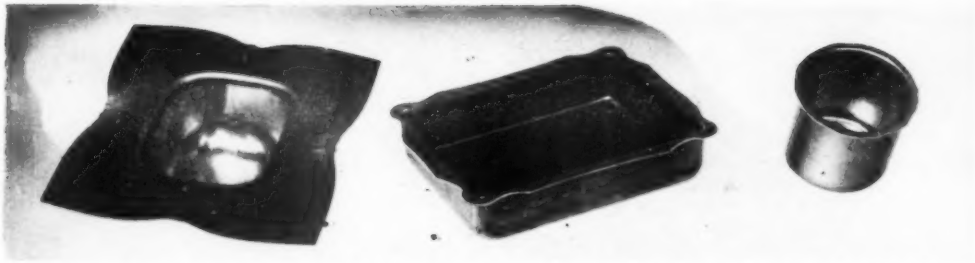
Cross between draw and stretch flange, this part was difficult to draw. Sample at lower left was made with material intact in bottom; the reverse bulge in the bottom was caused by the pressure of air trapped under the metal. Vents in the block would eliminate this. Lower-right sample was made with the bottom cut out to permit more stretching and less drawing. However, the blank was cut improperly and was pulled off center. Forming was stopped at this point because the part would obviously crack if forming continued. Blank size was too large at upper right. Elongation required was 16.6%, so the part cracked. Sample at upper left (the 18th attempt) was formed successfully. Part was coated on both sides with paraffin as before, but it was exactly the right size and was located in exactly the right position. All samples are 0.040 gage 24S-O Alclad



Drawn oil-drip pan cracks because the rubber locks the metal in the large flat areas. This could be avoided by a smaller flange, a lubricant, or a protecting block



Protecting block is cut at the corners to avoid breakage. This block reduces pressure on flange of part so it can be drawn into form block



High-pressure method formed these parts. The cup has been formed to a depth equal to 1.2 times the diameter. This is 2.4 times the depth that can be formed in a steel die. This is possible because the rubber locks the metal which has already been formed so that there is no further stress on this metal

true and more pressure is exerted against the flange of the blank. The gap or height of undercut is also important, because its increase or decrease determines the amount the overhang of the protecting block must be depressed before it begins to exert pressure on the flange of the metal blank. Although no exact rule can be stated, the gap should generally be from 0.003 to 0.006 in. greater than the thickness of the metal to be formed. Although the flange of the part must be protected, during forming, from too much friction between itself and the rubber or the form block so that it will not break, sufficient pressure must be exerted on the flange to keep it from wrinkling. The same situation exists regardless of whether or not an insert is used in a second forming operation.

A recent development enables accurate parts to be formed with a steel punch and rubber pad even though radical shrinking of metal is involved. Pressures are much higher than usual, ranging up to 20,000 psi. A fairly high pressure is applied to the blank before forming begins, to prevent the development of wrinkles.

Excellent control is established over the process throughout the forming stroke. A control mechanism on the machine can be preset to give any desired relation between forming pressure and stroke position.

With this process blanking can be perpendicular to the direction of stroke as well as parallel, so that parts can be trimmed to size after forming and in the same operation.

Although most of the work with this process has been done in aluminum, the parts have been made from stainless steel and there is actually no limitation on the metals which can be formed. Parts can be painted before forming if the finish applied will stand the deformation involved.

Blanking Procedure

BLANKING in rubber produces an edge that is better than that obtained by band sawing and almost as good as that obtained by routing. At unit pressures of from 800 to 1000 psi., rubber is quite capable of blanking 0.025 and 0.032 gages of 24S-O and can even blank some jobs in 0.040 gage. Rubber blanks most effectively on long curves or straight sides but will blank fairly sharp cutouts satisfactorily. Rubber will not, however, blank holes or notches in which the minimum opening is less than 2 in. in the smallest direction.

The main objection to blanking in rubber arises from the fact that a fairly large amount of metal is wasted. This in turn arises from the fact that 1½ in. must be allowed beyond the edge of the blanking punch to insure a good blanked edge. This means that 3 in. of metal is wasted between any two adjoining blocks. Two inches of metal must also be wasted between the edge of a blanking punch and the edge of the sheet. This waste of metal tends to prevent rubber blanking from competing successfully with other methods of cutting.

Another serious objection to rubber blanking arises from the fact that two or more sheets cannot be blanked at one time, regardless of the gage. The economic seriousness of this can be appreciated readily when it is remembered that a number of

New high-pressure process produced part at left. Compared with one formed by conventional rubber pad method. In the new method parts can be trimmed to final shape in the same operation and there is no limitation on the direction of blanking.

sheets can be stacked together and routed or sawed at one time.

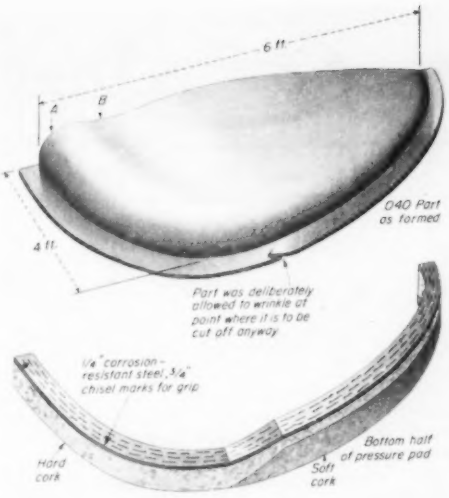
A third objection to rubber blanking is that the rubber attempts to pull the metal over the edge of the punch and therefore stresses the metal at the edge. This stress extends for an average of about 3/32 in. back from the edge of the blank and subsequently prevents the metal from being formed as severely as it might be if it were cut by some other method.

In rubber blanking, the rubber naturally forms the female portion of the blanking die. The punch is usually made according to either one of two different designs.

One design consists simply of a Masonite block. Steel strips ground sharp on one edge are inserted in this block in such a manner that the sharp edge projects 3/32 to ⅛ in. above the surface of the block. The steel blades are bent so that they follow the outline of the blank to be cut.

The other, and most popular type, of punch consists of a solid steel plate ground to the proper outline. The plate is ground so that it has a negative rake of 1 or 2°. The plate is then flame-hardened around the edge. These plate punches may be welded to a base plate in such a manner that they cut the sheet as economically as possible, or they may simply be arranged by hand on the loading table of the press. Arranging them as individual units allows more flexibility, since the units can then be adjusted to suit new conditions.

No locating pins are required for the blanking operation. However, if desired, the blanking punches can also be made to prick-punch the blanks in places where holes are to be drilled.

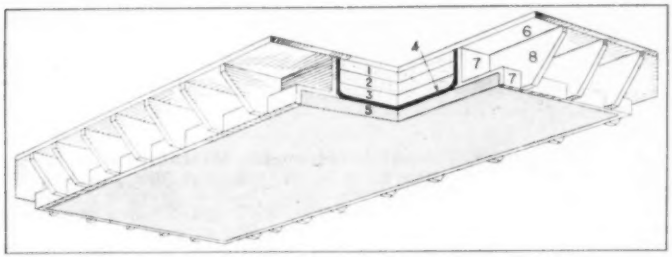

6 ft
A
B
4 ft
040 Part as formed
Part was deliberately allowed to wrinkle at point where it is to be cut off anyway
¼" corrosion-resistant steel, 3/4" chisel marks for grip
Hard cork
Soft cork
Bottom half of pressure pad

Large drawn shell is difficult because region *A* requires severe forming, there is a reverse curve at *B*, and the remainder is lightly formed. Soft cork is included in areas of light forming. It exerts only enough pressure to hold the part while initial forming takes place at *A*, is then compressed enough to form the remainder. During this final forming a properly shaped block of cork descends in region *B* to form the reverse curve. The form block was made of wood covered with Cerrobend. Hundreds of wood screws were left projecting from the wood to hold the Cerrobend, which was cast on the form block and then ground to the required contour. The quantity required did not justify the cost of a steel die for this part

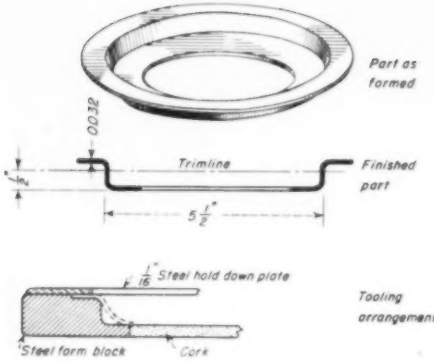
Cork and Cerrobend Forming

When compressed, rubber attempts to flow appreciably in all directions, much like a viscous liquid. For this reason, rubber is boxed in a strong container. Cork, on the other hand, only deforms a slight amount in any direction other than the direction in which the load is applied and is hence sometimes used in place of rubber. For example, a 5-in. cube of composition cork compressed vertically to 2½ in. and (not restrained by any retainer) bulges only about 3/16 in. As a result, much lighter retaining boxes are possible with cork than with rubber and, in some cases, cork requires no retainer at all.

However, cork deteriorates much faster than rubber when subjected to forming abuse, even though the cork employed is not natural cork but a bonded composition of various grades of ground cork. Harder cork compositions deteriorate much faster than softer compositions, but harder cork gives more pressure with less deformation. Combinations of various grades of cork are often used in the same retainer with the harder cork farthest



Cork retainer with rubber to slow cork deterioration and to hold it in position. Hard cork *1*, medium cork *2*, and soft cork *3*, are bounded by sack *4*, of ⅛-in. rubber sheeting which is cemented to the cork. Total thickness of this assembly is about 5¾ in. Rubber slab *5* is a 1½-in. blanket of 72 durometer rubber. Base plate *6*, shell *7*, and bulkheads *8* are welded-steel construction to make up the retainer. Form blocks can only be placed under the cork

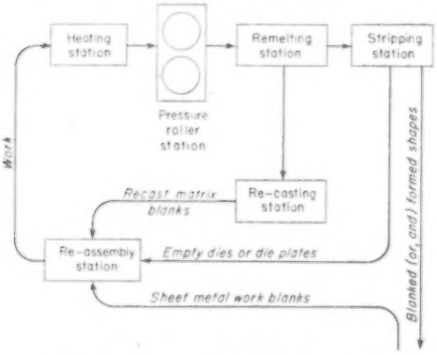


from the parts to be formed to build up pressure and softer cork closest to the work to be formed to stand abuse. As a rule, the higher and sharper the punch, the faster the cork will deteriorate.

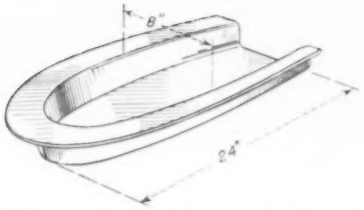
Even though the cork has deteriorated, it is still satisfactory for forming if it remains in the retainer. Rubber is sometimes employed as the outside layer in the retainer in order to prevent the cork from deteriorating rapidly and to hold it in the retainer when it has deteriorated.

Because cork retainers can be lighter in construction little of the pressure is dissipated into the walls of the retainer when cork is used, unit pressures can often be higher when forming with cork than they are when forming with rubber. In fact, unit pressures as high as 2200 to 2400 psi. are employed.

Cork offers a little less resistance to forming down into corners than rubber does and deeper and sharper draws can be made successfully. One part is illustrated in which it was necessary to cut a circular opening in the bottom in the forming operation to save the cost of an additional blanking operation. This blanking was done by means of a properly cut blanking hole in the bottom of the form block. However, had this been simply an empty hole, the hole in the metal would have been blanked out before the sides were formed. The



Operating cycle of Cerrobend forming process. Ordinary Cerrobend is used at room temperatures, removed by melting. At elevated temperatures it has increasd formability. A special Cerrobend has greater plasticity at elevated temperatures, but shrinks on cooling



Deep draw made in cork faced with rubber. It is 0.064 gage 24S-O formed to 2 in. depth at a rate of 90 per hour

Deep, sharp draw made with 3 in. of cork and ½ in. of rubber at 2200 psi. Blanking was retarded until after part had been drawn into corners by a cork disk in the blanking hole. Without this, part would have been blanked when drawn to shape indicated by dotted lines

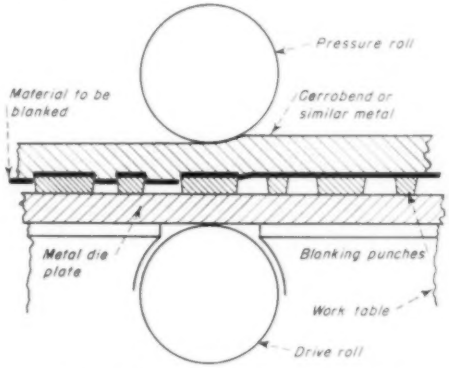
blanking hole in the form block was filled with a cork disk. This delayed the blanking action just long enough to allow the metal to form down into the corners of the depression first and then assisted further by acting as a stripper to remove the blanked portion from the tool. This part was formed using a combination of 3 in. of cork and ½ in. of rubber as a punch at a pressure of 2200 psi.

Cerrobend Forming

Cerrobend (and similar materials) is a low-melting-point alloy. In fact, it melts below the temperature of boiling water. It is a ductile material and can be employed to form parts in a patented process similar to rubber or cork forming.

Because Cerrobend reacts only in the direction in which it is loaded, no retainer is needed. When required, a form block can be designed to retain the Cerrobend in a local area so that it reacts strongly against the side of the block. In this way holes can be blanked in the side of a flange already formed.

Despite these advantages, Cerrobend is not widely used because it must be remelted and recast after each operation.



Cerrobend forming press. Blanking punches should be fastened to the die plate to avoid shifting. This fastening is preferably temporary. Punches are undercut so scrap can drop clear. The same method works with form blocks. Although too expensive for ordinary forming, it works for jobs such as a shrink flange without flutes

ROUND TABLE

Passing the Hat

"The boys are passing the hat again out there, Al."

"What's it for this time, Ed?"

"Oh, they're raising a fund for old Penner. The poor guy's been taking it on the chin lately—first it was his wife's operation and now he's laid up with that back of his—slipped disk, I think they call it."

"I'm not saying that Penner isn't worth a little help, Ed; but truthfully, what do you think of this business of passing the hat in the shop?"

"Well, to be honest with you, Al, I can't see that it's any harm—can you?"

"Only this, Ed: It seems to happen every few days, and money doesn't grow on trees any more. The idea of taking a little from everybody is all right, but it can be overdone."

"It isn't much from anybody, Al, and I like to think of the benefit that will come to the old man —God knows the chap needs financial help and a morale uplift."

"Seems to me that such matters should be handled by the Personnel Department, Ed."

"It might be," Ed frowned. "There isn't the personal touch, though—Penner'll get quite a lift knowing that the boys chipped in to help him."

"How do you think the Personnel Department'll feel about it—doing in your department what is supposed to be done in theirs?"

"Oh, I think you're too technical, Al; this is sort of a matter between people."

"What would you think if they were to take on some of the work that rightfully belongs in your department?" Al replied.

"If it resulted in benefit all round I wouldn't mind—in fact, I'd appreciate it if some of the work were done by somebody else," Ed smiled. "That combination die that we've been having such a time of lately, for instance."

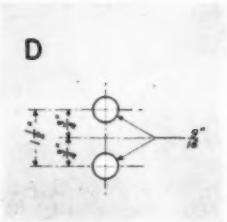
"I think that these things should be handled by Personnel—or we should have a 'kitty' set up on a budget basis—a sort of combined fund to which everybody kicked in a small amount each week. Then we could draw from this welfare fund when something comes up, and there wouldn't be any load on anybody."

"That might not be a bad idea, Al, at that. But we haven't got a 'kitty,' and old Penner need it now. Besides, who'd handle the dough if we had one—and who'd decide how much went out each time?"

"Here," smiled Al as he pulled out a crisp five-spot, "maybe this'll help out—but mind you, Ed, I'm not agreeing with you about the idea at all; I'm just carrying out a little lesson I learned in Sunday School when I was a carefree kid. A fund could be handled for us by the company—and the amounts to go out or in decided by the men—we could even have a schedule of fixed amounts. That would avoid the variations and bad feeling we get now."

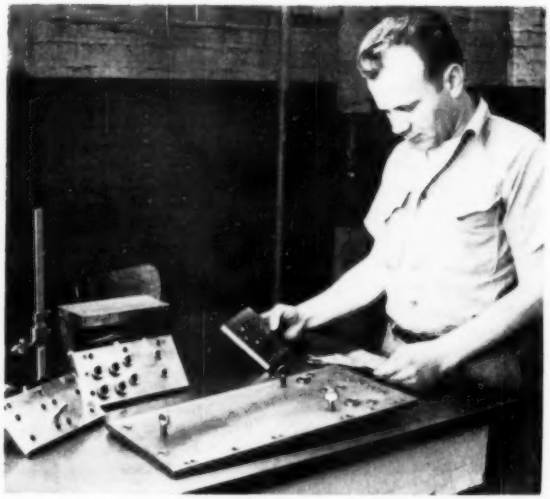
IS A "WELFARE FUND" ADVISABLE, *to take care of illnesses, weddings and the like? Can one be handled sensibly? Does it cut discrimination and variation? Your ideas and opinions will help others. Discussions of earlier topics appear on later pages.*

Four bus bars are punched in the time formerly required for one. The Wiedemann turret punch press has 12 stations, in which punches are set up or removed to handle 20 standard hole patterns. Inset sketch shows hole pattern **D**. Left—To start punching a long bar at specified distance from the end, the operator uses an adaptor to set the stock at correct hole-pattern position, since the scale in punching table starts 12 in. from punch-press centerline. Right—Progressive punching is always done against a positive stop. These swing stops are set to the table scale and are progressively swung back as the copper strip is advanced from dimension to dimension specified on drawing

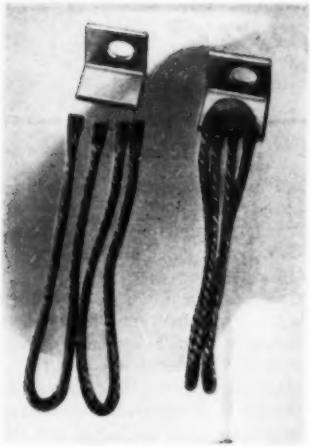


SHOP SHOTS

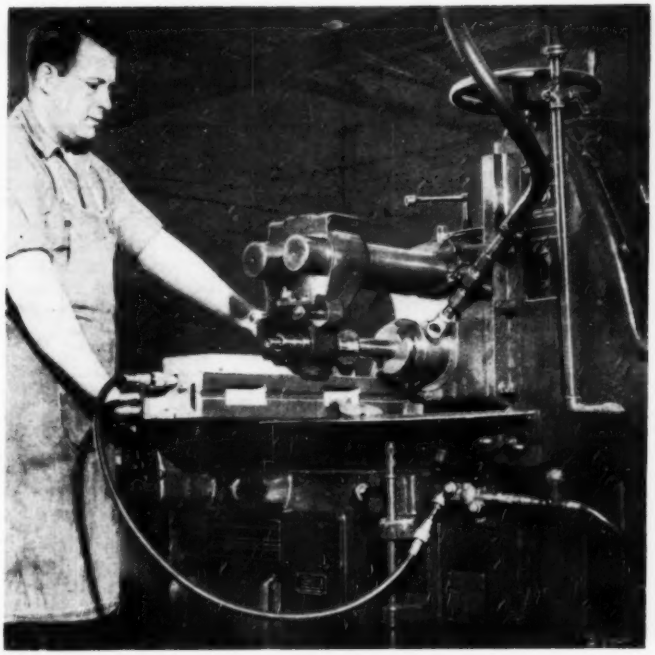
AT I-T-E CIRCUIT BREAKER CO.



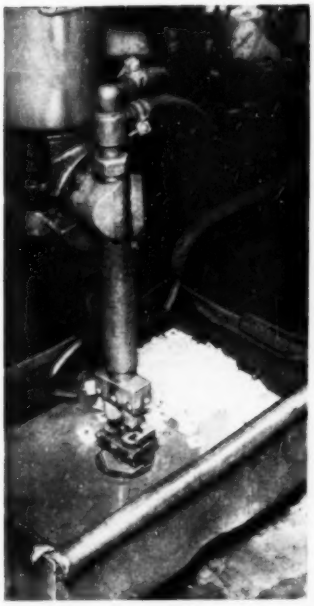
Interchangeable tooling plus a new machine showed a production increase of 50 to 80%, depending on job. **Left**—A Natco B2B with two adjustable-center heads replaced single-spindle equipment for multiple-hole drilling of miscellaneous short-run parts. Large table takes one or two Airlox vises operated by pedals. **Right**—Bushing plates for various jobs have screw-hole and dowel-pin holes on standardized centers for mounting on dead jaw of vises. Operator shoves part into vise (on rails) and up against stop pin in underside of bushing plate, then trips pedal. Setup permits operators to work on two pieces simultaneusly, or on first and second operations



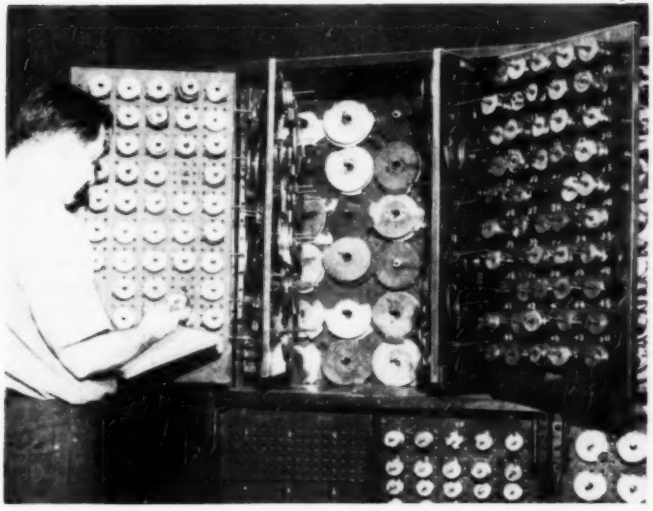
By spotwelding flexible copper leads to terminal and contact arm, better electrical conductivity is achieved, and future corrosion of joint by entrained flux, as in soldered connections is avoided. Setup is shown in illustration below



Output is increased on milling jobs by having the Airlox vise open and close as part of the automatic machine cycle. Vise is connected to an air valve of the spring-return type, which is normally open. Thus, vise remains closed until the table reaches the end of the return stroke, at which point an adjustable trip dog depresses the lever closing the valve, and the spring-return cylinder opens the vise

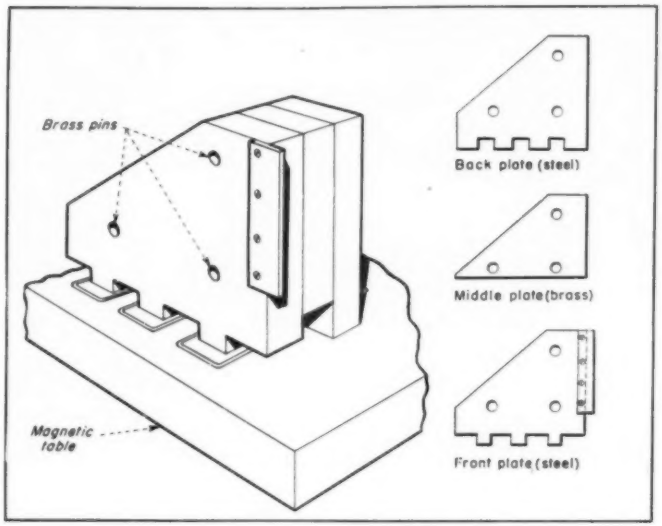


Water acts as a flux and prevents annealing while spotwelding the contact-arm assembly. Welding timer has two heat controls: low heat for terminal; high heat for heavier contact arm, the shift being made by a ratchet relay in timer. Parts are pre-cleaned in plating room, copper lead requires no cleaning



Inner doors have been added to this storage cabinet to increase peg locations for screw-machine cams and form tools. Tools have part number and revision number etched or engraved thereon, and their peg locations are catalogued in a card index kept by the foreman

Practical Ideas

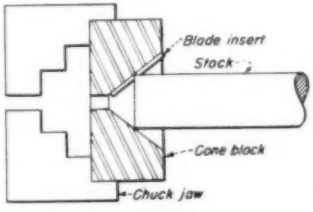


Magnetic-Extension Fixture Adapts Surface Grinder

UNUSUAL GRINDING JOBS can be handled on a surface grinder with this attachment that clamps by magnetic power. Through the design of the fixture, magnetic lines of force are routed through the work, providing it is a magnetic material such as steel, and make it possible to set up work above the table with magnetic power alone.

Two mild-steel plates are milled and shaped to the illustrated design. The bottom extensions or feet are spaced according to the specific grinding table to which the fixture is to be applied, with one plate resting, through the feet, on the electro-magnetic inserts and the other resting on the steel table. The two are insulated from each other by a central brass plate assembled with large brass pegs.

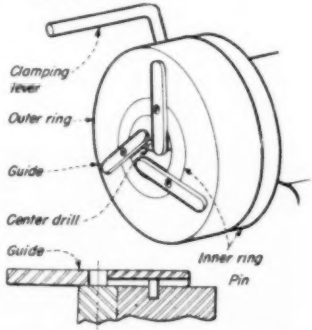
A vertical piece, attached by screws, is along the edge of one plate to align square work with the vertical edge. Many types of small parts can be held easily with this arrangement, as long as they bridge the gap between the steel plates. The angled surface, at about 45°, is for special work and can be varied as the mechanic requires it. *Harry Smith, Long Branch, Ontario.*



Guides Position Bars For Centering Operation

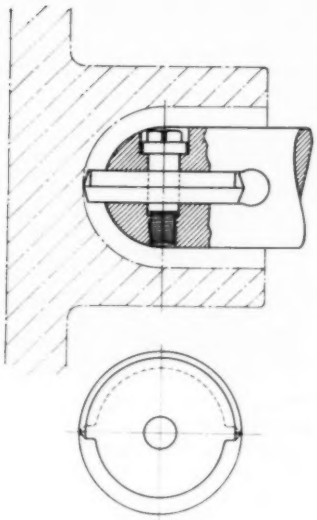
CENTERED BAR STOCK for production work and for customers' orders is produced in a small engine lathe with a capacity of 2 in. dia.

The drive cone is a block of steel bored out to about a 45° taper, with a high-carbon-steel blade pressed into a slot along the face of the truncated cone. The block is clamped in a universal chuck and work is pushed into it from the tailstock. The blade cuts a small nick in the edge of the round, through which the headstock drives the work. If the blade slips a slight bevel is cut on the work, but this is unimportant.



The tailstock centering fixture is made of two rings, one inside the other. An inner ring, fixed to the tailstock carries three work guides pivoted on screws driven into the face of the ring. The outer ring carries three pins that nest in longitudinal slots in the under faces of the guides and which rotate to turn the guides in on the work as the clamping lever is pulled toward the operator.

The guides are faced with phosphorus-bronze welding to lengthen their life. After the work is located in the headstock, it is aligned with the guides and the tailstock is moved up, the guides clamped, and the tailstock spindle, carrying the small center drill, moved up to cut the piece. With this arrangement, the headstock rotates continuously, and work is loaded and unloaded by hand. *International Nickel Co., Huntington, W. Va.*



Finish-Forming Cutter Made From Bar-Stock Disk

AN UNUSUAL TOOL for finish-forming a blind bore with a full radius at the end was made by sawing a 9/16-in. disk off a $2\frac{3}{4}$-in. high-speed steel bar.

The cutter was finish-ground all over to a diameter of $2\frac{1}{8}$ in. The center hole was drilled for a convenient bolt to hold it in the split holder firmly. Both cutting edges were kept on center, and a slight land was left on both edges to allow for regrinding. The cutter could be reversed completely in the holder to present a new edge, and was reground three times.

In practice the tool removed about 0.001 in. all around, which produced a smooth surface on the nickel-iron workpiece without chatter marks. The low-carbon-steel holder was held in a turret on a lathe. *G. R. Milner, Gainsborough, England.*

Micrometer Sleeve Scribed

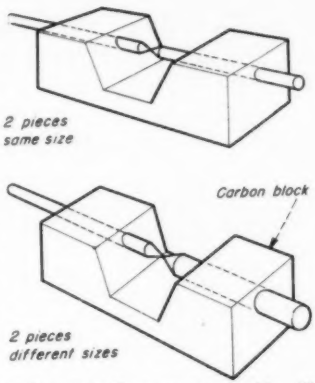
GRADUATIONS on a special micrometer sleeve were made on a lathe, without an indexing fixture, by employing a large disk of Bristol board.

The board was laid out accurately with drawing instruments, cut and drilled, and mounted with a plug on the rear end of the lathe spindle, behind the head. A pointer attached to the lathe indicated the division marks as the sleeve, which was chucked in the lathe, was rotated and marked.

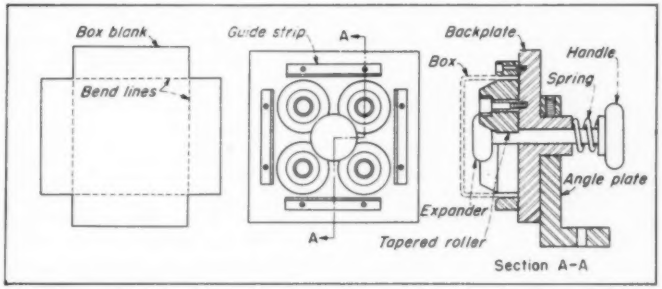
Because the board was 12 in. in diameter, the reduction in radius to the sleeve reduced any slight errors in the layout to practically nothing. *Karl Haller, Millington, N. J.*

Rods Welded Together In Carbon-Block Fixture

CARBON or graphite blocks are handy for forming holding fixtures for welding jobs. Rods of the same or different diameters are easily welded if a block is cut out in the center and drilled from both ends



—the centerlines must coincide. If a few thousandths extra are allowed, the rods can be rotated as they are being welded. After the job is done, the block is broken and removed so the rod can be ground off. *Don McIntosh, Bay City, Mich.*

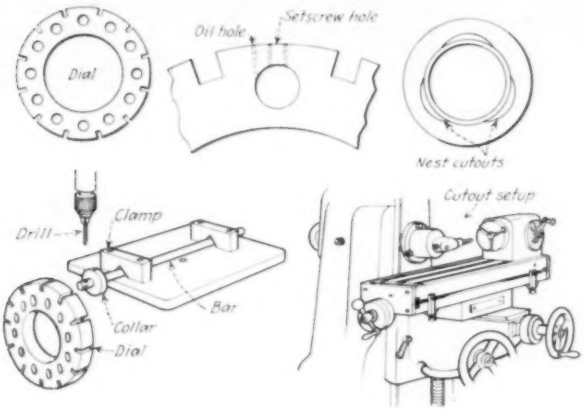


Expanding Rollers Clamp Box for Welding

METAL BOXES were made in low-production quantities with an angle-plate fixture that positioned the sides for welding. Blanks to form the bottom and sides were cut and bent, and then placed in the fixture.

Four chamfered guide strips were bolted to the backplate to locate the sides at the correct dimension, and four tapered rollers were expanded by spring pressure and an expanding head to force the sides against them. The rollers were mounted by bolts to the backplate, but the holes were oversize so the rollers could shift. A compression spring on the expander spindle held the rollers normally closed against the guides. A setscrew held the backplate in a hole in the angle plate.

The operator mounted the box by pushing the expander handle to loosen the rollers, set the bent box in place, and released it to clamp. After welding the four corners, the work was removed by again releasing the rollers. *William H. Genich, Racine, Wis.*



Power Dial Drilled and Tapped On Simple Drillpress Setup

OUR METHOD for drilling and tapping setscrew holes and drilling lubrication holes in a dial for a power dial press has been improved with a setup that may be valuable for the same or similar jobs in other shops.

Originally the holes around the periphery of the dial were drilled on a mill with a rotary table, but the new method is much faster. After the nest holes that take adapters for different size diameters have been bored and the indexing slots have been machined in a mill, the job is moved to a drillpress.

A rod with the same diameter as the nest holes is clamped on the drillpress table with an end overhanging. The drilling spindle is moved over the end of the bar and locked in position over the centerline of the bar. Then a hole is drilled through the bar and the top of the hole is filed off flat for chip clearance later. The hole drilled should be large enough to clear the tap to be used.

Then a collar is mounted on the bar behind the drilled hole and is clamped to position the dial correctly for drilling the setscrew holes. The dial is mounted on the bar by the nest holes and the setscrew holes are drilled all around the dial, then tapped.

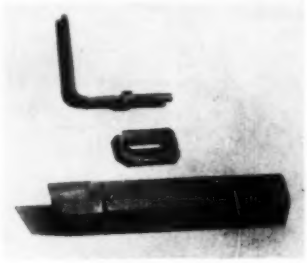
In this setup the dial centers itself automatically by gravity, and since the setscrew holes are drilled to the centers of the nest holes, no other support is necessary for correct alignment. The lubrication holes are drilled by moving the bar over slightly so that the smaller drill will work down tangent to the nest holes and will pierce the wall near the middle of the nest. Holes through the nests must also be drilled.

For the lubrication holes some other support besides the bar must be added, since the drill will place a side thrust on the dial. This is most easily done with another rod or bar mounted under the table in a position to engage another nest hole.

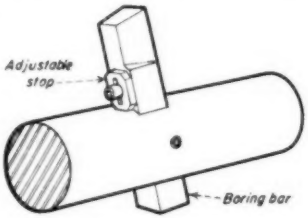
Cutouts in the nests to spread the lubricant can be milled with a universal attachment on a horizontal mill, with the nests and dial set up in an indexing fixture. *Ray Cafiero, Brooklyn, N. Y.*

Slotted Plate Helps Reset Boring-Bar Toolbits

THIS TOOL was designed for replacing those installed in horizontal boring mills and turret lathes which must be removed and replaced often for sharpening jobs. The old-style tools were located with dog-tailed setscrews through slots in the tools and into the boring bars, but these were not easily adjusted for the stock removed during sharpening.



The new tool is clamped with a setscrew in the bar, but another screw clamps a slotted plate to the back side of the bit and snug against the bar. After the tool has been sharpened and is cutting

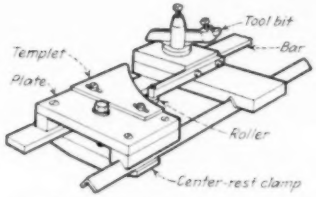


undersize, the tool is loosened, a feeler gage the size of the radial difference between the required size and what the tool is cutting is placed behind the plate next to the bar, and the tool is retightened. The plate can then be relocated. *Eaymond E. Baldauf, Marion, O.*

Lathe Templet Guides Tool For Turning Special Shapes

SPECIAL SHAPES and radii can be cut on a lathe with a simple setup that requires only easily-made parts. Although the templet for the work must be accurate to produce accurate work, the other parts can be made from scrap.

A plate of cold-rolled steel is clamped across the bed of the lathe and to it is bolted the required templet shape. The cross-slide chip guard is removed and a bar carrying a roller is bolted in place. The chip guard can be re-

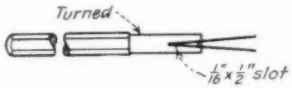


assembled if desired. With a standard toolpost setup, the lathe turns the templet shape under regular leadscrew power.

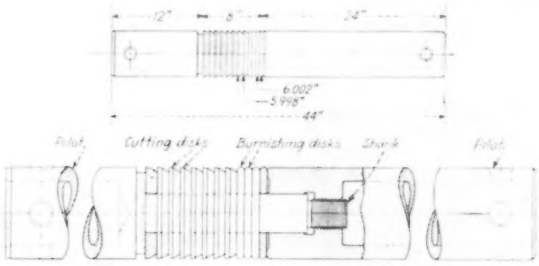
One point must be noted: for accurate reproduction of the templet shape the lathe tool must be ground to a true radius of the same size as the radius of the roller. With this in mind, the mechanic can grind a templet from sheet steel to the exact dimensions required and no allowances for the roller diameter are necessary. *Arthur G. Ranslow, Elmhurst, N. Y.*

Spring Blades Grip Screws

WE MAKE 200 screwdrivers at a time for use in our plant, so we had to devise a durable and cheap type to prevent excessive costs. The one we standardized is illustrated.



The body is turned from ¼-in. hex stock. A slot is made in the end on a mill and two spring-steel blades are assembled with a short piece of 0.050-in. wire separating them at the end of the body. The blades are soldered in place and are ground even, with a slight curve on the ends. The blades can be ground quite thin for small screws, or left at the original thickness for large screws. *Ferd. J. Haas, Waukesha, Wis.*



Built-Up Broach Finishes Cast Cylinders

BROACHING AND BURNISHING were accomplished with a tool made up from two pilots, a center shaft, 8 circular cutters and 4 burnishing disks. Cast-iron cylinders with a 6-in. I.D., 23 in. long, were finished with their inside diameters sized and hardened. The burnishing operation provided a smooth, hard-wearing surface with the metal's grain aligned with the stroke of the piston.

All parts were hardened and ground where necessary, with the cutter edges tempered to provide toughness. Careful grinding was necessary to match the inside and outside diameters of the disks with the O.D. of the center shaft, which was integral with the front pilot. The fits here were close.

Replacement of the largest cutter, when all became worn, was all that was necessary beside regrinding. The smallest cutter was removed, the new one placed at the back of the tool, and all cutters were reground on the shaft. Both pilots were bored out to reduce their weight. The tool was installed on a vertical machine where one stroke forced it through the work. *G. R. Milner, Gainsborough, England.*

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for the best

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PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

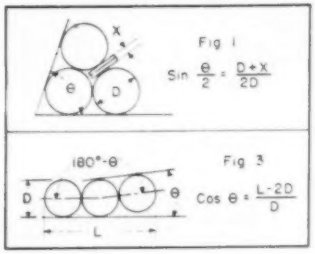
WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER — Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 18, N. Y.

71ST WINNER:

JOSEPH F. BUDNICK—

Double Punch Cuts Washers



Layout-Disk Corrections

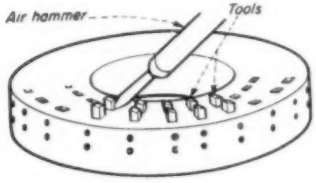
SEVERAL CORRECTIONS must be made to the recent article on three layout disks before the set of diagrams and figures can be used without error. In Fig. 1 the angle marked 20 should be marked as only θ. In Fig. 2 the angle θ appears as 0, which should be altered.

The most serious error is in Fig. 3, where the formula should be changed to $\text{Cos } \theta = \frac{L - 2D}{D}$. The large angle is $180° - \theta$.

The illustrated diagrams can be pasted over the originals to provide correct methods of finding small angles for layout. *W. Wallace Boyd, Glen Ridge, N. J.*

Air Hammer Repairs Damaged Slab-Milling Cutter

SLAB-MILLING cutter bits often break off at or slightly below the surface of the holder. When they do, the hole in the holder usually is distorted enough that a new bit cannot be set securely in the hole until a repair is made.



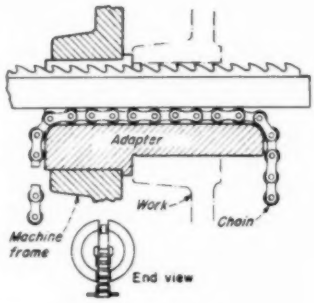
An air hammer with a chisel-shaped blade is employed to pound the metal of the block back around a new bit after it is installed. This can be done a number of times before the holder must be welded at any one point, and it makes machining the hole unnecessary because the tool is set in place to form its shape in the block before hammering begins.

Aside from the saving in time involved, this keeps the holder more nearly in its original shape and condition than is usually possible. *International Nickel Co., Huntington, W. Va.*

Split Tap Cuts for Oversize Studs

SEVERAL 1-in. tapped holes had to be enlarged to take special plated studs that were slightly oversize. To do this I split a 1-in., 4-fluted plug tap up about 2/3 of the length of the tapping section with a thin cutoff wheel. Then I inserted a thin wedge into this slot to spread the tap sections slightly.

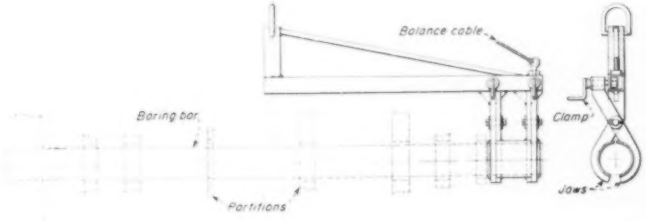
This made tapping the holes oversize easy, and saved the cost of recutting and plating the studs. *George Hibbard, Niles, Mich.*



Chain Rolls Broach for Near-Capacity Job

KEYWAY broaching on a low-powered machine was eased with a roller chain that reduced friction in the machine. The chain, which rode under the broach while it was cutting, provided an anti-friction bearing surface for the broach.

The chain was somewhat longer than the broach, and two pins were inserted in the two end links to prevent the chain from falling out of the machine. It was returned by hand after each stroke to position for the next stroke. *G. R. Milner, Gainsborough, England.*



Hoist Rig Transfers Boring Bar

IT IS A PROBLEM in many shops to handle large boring bars, especially when they must be strung through a number of partitions. Rope slings are not only dangerous, but they require a lot of work to shift the ropes around each partition.

A boring bar can be handled with the illustrated rig, providing the rig is made to the correct dimensions for the bar. The clamp is outside all obstructions, so no difficulty is encountered in moving the bar in and out of position.

The ring for the hoist hook is located at the center of gravity of the bar and the rig combined. The same rig can be employed for smaller bars if a balancing cable, from the end of the rig to the hoist, above the hook, is employed. This balancing cable may be useful even if the rig is balanced to prevent swaying. *Willard Jensen, Longview, Texas.*

NEWS OF METALWORKING

ECA Machine Tool Policy Change Urged To Permit More Purchases from U. S.

Restoration of the normal European market for American machine tools would add 50% to the industry's present low volume, support sagging employment in American plants, expedite industrial recovery abroad, and maintain the industry partially in the condition desired by our National Security Resources Board.

So stated A. G. Bryant, chairman of the Government Relations Committee of the National Machine Tool Builders' Association in speaking before the Senate Foreign Relations Committee Feb. 17 to urge a change in the direction of ECA policy and performance with respect to allotments for machine tools.

Such a change is "crucial both to the Recovery Program and to the American public interest," Mr. Bryant said, citing three reasons:

1. Recovery in Europe has been slowed down because American machine tools immediately available have not been utilized, while ECA funds have been used to buy less productive British and European machines, in many cases unavailable in less than one or two years' delivery.

2. Building up of machine tool manufacture in Britain and western Europe has enabled these countries during 1948 to ship vital machines to Russia and her satellites.

3. The unnecessary purchase of British and European machine tools in place of the American machines requested by European industrialists has diverted to the building of such machines labor and materials which could have been used to better advantage in manufacturing other products.

4. By unnecessarily usurping American machine tool markets. ECA participating nations have weakened a vital industry which is of paramount importance to European recovery and for the defense and economic well-being of the United States.

Asked to Permit Inclusion of U.S. Tools

Mr. Bryant, who is president of Bryant Machinery & Engineering Co., Chicago, recommended that Congress authorize ECA to direct participating countries to include American machine tools in their requests for allotments where such have been specified and requested by the industrial users of the respective nations.

Joint Turbine Studies

LONDON — (McGraw-Hill World News)—W. H. Allen Sons and Co., Ltd. of Bedford, and The Bristol Aeroplane Co., Ltd. have concluded an agreement calling for collaboration on the application of gas turbines for marine auxiliary purposes and in the industrial field, and for the exchange of information on aeronautical and industrial turbine problems.

Cited for Labor Relations

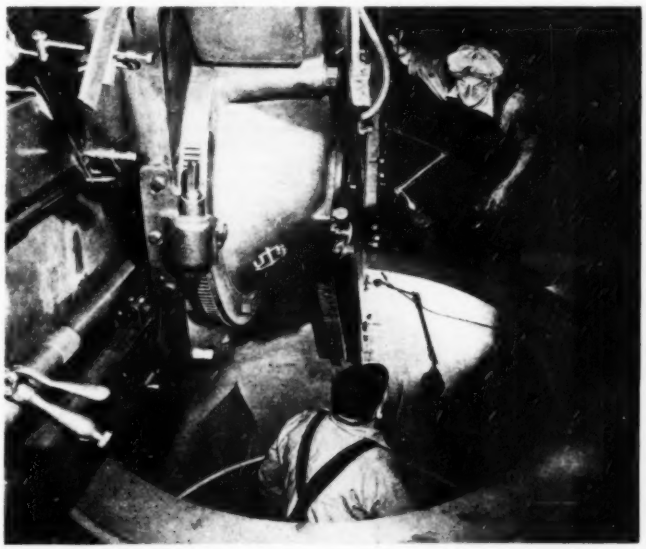
The George Gorton Machine Co., Racine, Wisc., received the 1948 Labor Relations Institute first place award for outstanding achievement in industrial relations. It was the first such award made by the Institute.

WPB's Machine Tool Men All Set for 'Emergency'

WASHINGTON—Should there be another "emergency," tomorrow or two years hence, the men who would run the machine tool section of the War Production Board would move into their jobs with no fuss at all.

The facts behind this bold statement are that the key men of the machine tool section of the production equipment division of the next WPB are already working. They met for the second time in Washington on February 17.

In a day-long session this stand-by group heard reports and comments from 10 of the "Phantom" department heads. The group is headed by Herbert L. Tigges, executive vice president of Baker Brothers, Inc., Toledo, Ohio, as chief.



CONTOUR MACHINING *of 60-inch hollow jet valve body at Todd Pacific Shipyards Corp., Alameda, Calif., prior to installation of needle support and other interior equipment. View shows the ram of the 10-foot Cincinnati boring mill operating off the profile and with the tool bit machining the welded monel seat. The body casting will be installed in the outlet works of the Enders Dam in Nebraska.*

Plants Set Up Production Pool

Job shops and small manufacturers in northern California are effectively combating a general falling off in their business by reviving the wartime production pool setup and combining it with an aggressive selling organization.

A contraction of the "farm-out" market in the state's adjustment from its giant war production resulted recently in the incorporation of the Small Industries of Northern California.

SINC maintains a central office with an inventory of the facilities and capacities of the members, enabling a quick meeting of purchasing agent and job shop owners qualified to do his job. Individual and competitive bids are made on the contract. Larger jobs may be handled by shops cooperatively.

The unique feature of the organization is the plan for a comprehensive sales program, to acquaint local and out-of-state markets with facilities available and to take the selling burden off small business owners.

A. S. Hertzog, purchasing agent for the Ames Aeronautical Laboratory, is grateful for the greater number of bids obtainable through use of SINC channels. He reported that the number he received on a contract for 70 mm. cameras was about twice what he would have expected before the association was set up. Low bid on the contract, let through the association, was about $26,000, some $3,000 below the next lowest figure. The laboratory was a new customer for the successful bidder, Metal Masters, San Francisco.

Jobs Can Be Done in Area

Manufacturers are discovering, too, that many of the jobs they formerly sent out of the area can be done right at home—with additional savings in time and money. The job shops represented are so small, employing an average of six machinists, that overhead costs are pared almost to zero. This economy is passed on to the contractor. And freight costs are dropped.

Advantages to the small businessman, besides the prospect of a steady flow of work and the influx of new customers, include cooperative buying of materials, with resulting savings. In some cases, quantity buying will also make hard-to-get materials more available.

Especially important is the saving in soliciting time. The manufacturers figure they spend from 20 to 25 percent of their time calling on prospective customers and tracking down jobs. That time is doubly costly when the proprietor is a machinist in his own shop.

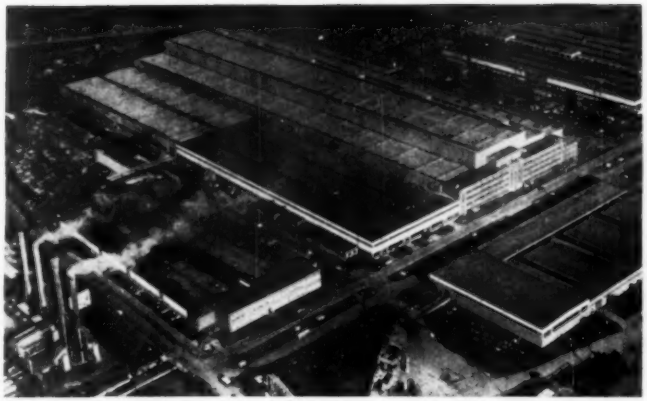
The group, incorporated last fall, now boasts a membership of about 100, with $15 a month dues. New orders obtained for members to date is $120,000, with bids outstanding of more than $350,000.

Among contracts let are the Ames Laboratory job, a $17,000 castings job for the Frank Pollard Co., a $5,000 contract for United Helicopters and smaller jobs for Dow Chemical Co. and Southern Pacific.

Included in bids outstanding is a team bid of five shops on a $50,000 job for Magna Corp., requiring screw machine, milling machine, turret lathe, sand casting, finishing and assemblywork.

Facilities offered by Small Industries as now organized include 640,000 sq. ft. of factory space, 1,800 pieces of production equipment, 700 skilled machinists and proprietor experience averaging ten years.

Equipment available is now manufacturing airplane parts, lighting fixtures, refrigerator equipment, automotive parts, household appliances and toys of metals, plastics and wood materials.



***TURBINE-GENERATORS** ranging from 20,000 kw to 200,000 kw will be produced in General Electric's mammoth new building at Schenectady, N. Y. Movement of heavy machinery into the $30-million building was begun recently.*

Drop in Metalworking Employment Not Enough to Worry Washington Yet

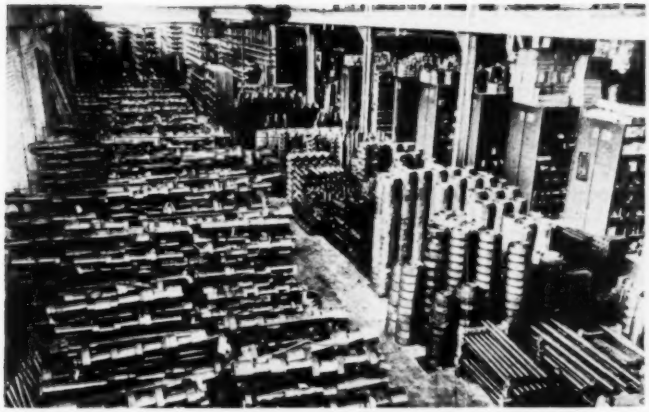
WASHINGTON — Unemployment is rising, but nobody in Washington is worrying about it—yet. Commissioner Ewan Clague of the Bureau of Labor Statistics estimated about 3,000,000 were unemployed in mid-February. He saw no cause for Government action, however, unless the number rose to 4 or 5 million and remained there for some time.

Government officials point out that total employment is not much below what it was a year ago. There are more unemployed because the labor force has expanded.

Return of "seasonal patterns" is given as the major factor in the rising unemployment. But this could hardly be true of the falling employment in durable goods manufacturing, which showed a drop from 8,256,000 a year ago to 8,228,000 in December, and to 8,033,000 in mid-January. In metalworking, there has been a drop in all major industries except automobiles.

Here are the Bureau of Labor Statistics figures for metalworking, with January being preliminary. Figures are for all wage and salary workers.

	Jan.	*Dec.*	*Jan., 1948*
Iron and Steel	1,893,000	1,936,000	1,925,000
Electrical Machinery	714,000	730,000	767,000
Machinery, except electrical	1,536,000	1,561,000	1,583,000
Transportation equipment, except autos	572,000	585,000	598,000
Automobiles	991,000	985,000	989,000
Nonferrous Metals	459,000	468,000	478,000



***PRESS PARTS** valued at more than $1-million are kept in storage by the E. W. Bliss Co. at its Hastings, Mich., plant. These standard inclinable press parts represent one phase of the program established to service the 200,000 Bliss-built presses in the field. All parts pass through stores and are withdrawn for either assembly or for replacement.*

Ford Seeks Heavier Auto Parts from Northern California Manufacturers

SAN FRANCISCO—Close to the $50-million a year goal set when it launched its West Coast purchasing program two years ago, Ford Motor Co. is striking out for heavier business to increase its local buying volume.

Fred Rumball, director of the purchasing program on the Coast, reported recently that the company's annual rate of buying in California has reached $45-million. Some 500 different automotive parts are bought in the state. Heavier and bulkier parts now being sought include body frames, radiators, accelerator parts, tubing and mufflers.

Mr. Rumball, headquartered at the Lincoln-Mercury plant in Los Angeles, was in the Bay area to confer with northern California manufacturers, seeking to conclude contracts for such smaller automotive parts as hub caps, hood hinges, muffler assemblies, accelerators, radiator and fender supports, crankshaft pulleys and oil filter tubes. He estimated there was a $200-million market for such parts for all automobile manufacturers in California.

The Ford official said he believed it would be "quite some time" before such major parts as bodies, motors and axles would be produced on the West Coast.

Douglas Aircraft Co.'s new automotive equipment division wants to build doors for Ford, he said, but he doubted such an arrangement could be made in the near future. Removal of 10 or 15 percent of the business from Detroit might throw costs out of line back there, he pointed out.

Others Not Buying Actively

Other auto assembly plants in the Bay area, although buying locally such parts as bumpers, springs, batteries and wheels, have not engaged in active buying promotions.

Dodge, however, is investigating possible expansion of its local buying of standard parts, such as fastenings, nuts and bolts.

Dutch to Build Engines

AMSTERDAM — McGraw - Hill World News)—Four Dutch engine factories under the lead of Kromhout Motoren Fabriek of Amsterdam have established the "Samofa," a combine which will set up a factory for the production of small Diesel engines at Harderwyk (province of Gelderland).

Turkey to Buy Farm Tools

Turkey has set aside $12-million of its $32-million ECA loan to buy agricultural machinery in the U. S. Purchases and distribution will be handled by private Turkish firms.

To protect farmers' interest, however, the Government has approved regulations limiting the margin of profit on these transactions. The equipment will be sold to farmers on a long-term credit basis.

Tool Control Plan To Help Cut Costs

Lowered break-even points through major reductions in manufacturing costs in metalworking industries—without requiring expenditures for capital equipment—may be achieved through more effective tool control, according to Carboloy Co., Inc., Detroit.

To help the metalworking industry achieve lowered costs, Carboloy is making available to manufacturers a comprehensive "coordinated tool control" plan, developed after several years of research and fact-finding in industry.

Some companies have already greatly reduced costs by putting such plans into effect, Carboloy says, reporting that in a midwestern engine plant a reduction from $3,000,000 to less than $700,000 in tool and fixture inventory was achieved by a program of standardization as a part of tool control. A relatively small plant recovered $14,000 worth of excess tools, scattered around its plant, in the first month of applying a tool control program.

While Carboloy, as a leading producer of cemented carbides, is primarily interested in carbide tools, it says that savings possible by reducing manufacturing costs through tool control apply regardless of the type of cutting tools used.

The tool-control program can be applied by individual manufacturers themselves, using these aids obtainable from Carboloy:

1. A manual of tested cost-reducing tool-control systems and practices, with actual examples of their application in different types of metalworking companies.

2. A complete training course, including six slide films, also reproduced in booklet form, for in-plant training of personnel.

3. A 200-page tool manual dealing with technical phases of tooling.

In addition, the entire Carboloy field organization, including district and branch office sales and engineering personnel, as well as tool engineers with distributors, is being made available as a consulting organization trained to help manufacturers put the plan into operation.

New Low Accident Rate

WILMINGTON, Del. — The 76,000 employees of the Du Pont Co. have established a new low rate in lost-time injuries in the more than 100 plants and laboratories throughout the country. The overall company frequency rate for 1948 was 0.72, less than one lost-time injury per million man hours worked, as compared with 0.91 in 1947.

Who Gets Laid Off—Vet or Union Official? Employers Seek Answer

Many employers are laying off workers for the first time since before the war. That explains the many more inquiries from employers coming in at offices of the Bureau of Veterans' Reemployment Rights. They want to get the last word on the job rights of war veterans under the wartime Selective Service Act and the draft law passed last June.

The problem usually involves the veteran's seniority rights as against those of a non-veteran. In 1946, Supreme Court decided in the Sullivan Drydock & Repair Corp. case that a veteran does not have "super-seniority," but is merely entitled to the protection he would have had if he had never left his job for war service.

Trailmobile Case Cited

Later, in the Trailmobile case, the court said that the returned veteran could not upset a union contract under which he and his fellow employees were put at the end of the seniority list when their plant was merged with another. The court's view: there had been no discrimination against the veteran.

Generally, the courts have followed the principles of those decisions. The veteran must not suffer by reason of his war service, nor must he benefit by it. He just gets back on the seniority escalator at the place he would have been if he had never got off.

Some courts, however, have found different elements in similar cases which cause them to come up with the opposite decision. The Supreme Court is taking a look at one of them, and will issue a decision soon.

Lockheed Aircraft Case

The case involves Lockheed Aircraft. It signed a contract with the International Association of Machinists, giving top seniority to union agents like shop stewards and committeemen. This is not an uncommon provision in industrial plants.

The issue arose when some veterans were laid off while non-veteran union agents with less seniority were kept on the job, just as the contract required. The veterans had been in the service when the contract was signed.

Could the union contract, made in the absence of the veterans, weaken their job rights? The Federal District Court said no. The Ninth U. S. Circuit Court of Appeals on the West Coast also said no.

This decision is in direct conflict with that of the Third U. S. Circuit Court in Philadelphia. This court, back in 1947, upheld a contract between Elastic Stop Nut Corp. and the United Automobile Workers, CIO, which requires the company to retain a non-veteran union official with less seniority while a veteran with more seniority is laid off. It reversed the opposite view of the District Court.

Because of this conflict, the Supreme Court agreed to review the Lockheed decision on appeal by the IAM.

The old and the new draft laws are similar, though not identical, as to job protection. Veterans must apply for the old jobs within 90 days after their honorable discharge from service. If possible, they must be restored to jobs of like seniority, status and pay. They may not be discharged without cause, within a year of their return.

War service credit has also raised some difficulties in figuring vacations. Robert K. Salyers, director of the Bureau of Veterans' Reemployment Rights, explains that court decisions have not been uniform because they are guided largely by the exact wording of the contract. Generally, the courts have not considered seniority rights in the same light as vacation rights. It's the exact wording of the contract that really counts.

New Machinists Union Head

The International Association of Machinists will have a new president July 1—Albert J. Hayes.

Mr. Hayes, general vice president assigned to grand lodge headquarters in Washington, was the only candidate nominated to succeed President Harvey W. Brown, who retires June 30 after 10 years as leader of the 651,000-member independent union.

IAM officers will be elected in a membership referendum in April.

Under the IAM constitution, Mr. Brown is retired at age 65 with a $300 monthly pension, part of it from railroad retirement.

Mr. Hayes, 49, began work as an apprentice machinist in the railroad shops around Milwaukee and joined the IAM when only 17 years old. He has been a grand lodge representative since 1934 and a vice president since 1945.

LEWIS C. EDGAR, JR.

New Bliss Head Locates in Toledo

TOLEDO—Distribution of parts for some 200,000 presses it has manufactured is to be centralized at the E. W. Bliss Co. plants in Toledo and Hastings, Mich., under a new program aimed to speed up delivery.

This follows the arrival in Toledo of Louis C. Edgar, Jr., to take over his duties as president of Bliss, preliminary to moving the firm's executive and administrative offices here from Detroit. At 38, Mr. Edgar is the youngest president since Eliphalet W. Bliss founded the the company 90 years ago.

A mechanical engineer graduate of Cornell, Mr. Edgar was associated with the Babcock & Wilcox Co. in the manufacture of penstocks for the Boulder Dam at Boulder City, Nevada, from 1933-36. From 1936 to 1946 he was with the Blaw-Knox Co. as a service and design engineer and finally as general manager of its Martins Ferry Division in Ohio. He became president of the H. & B. American Machine Co. in 1946 and served in that capacity until his recent election to the presidency of the Bliss Co.

Detroit Firms Join

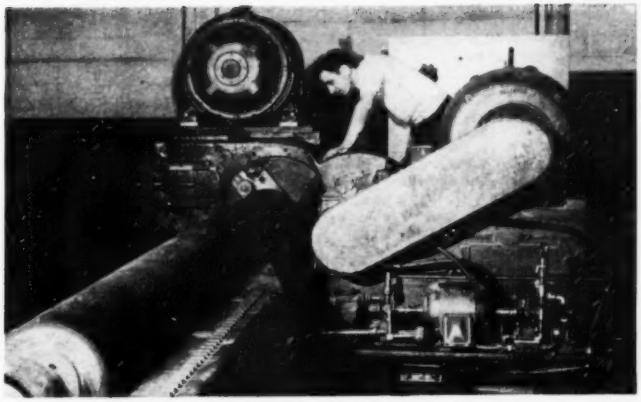
DETROIT — Two pioneer Detroit firms were united here when Snyder Tool & Engineering Co., builder of production machines for the automotive and similar industries, purchased Arthur Colton Co., builder of production machines for the drug, plastics and packaging industries.

Semi-Durables Pushed in S. A.

South America's infant steel industry, with its recently built blast furnaces, rolling mills, and related basic equipment, has prompted alert governments there to promote enterprises which will turn the output of this industry into finished goods.

The plan, according to Robert E. W. Harrison, consulting mechanical engineer just returned from Buenos Aires and Rio de Janeiro, is to aim, first, for the simple everyday items of household and farm use, and later, as techniques are established, to manufacture more complicated appliances—refrigerators, radiators, small boilers, and similar semi-durables.

Time is not far distant, Mr. Harrison believes, when the larger South American countries, going beyond their immediate need for semi-durables, will be able to make their own motor cars, trucks, airplanes, and railroad equipment.



ROLL GRINDER *installed recently by the Goodyear Tire and Rubber Co., Akron, Ohio, in its newly expanded Industrial Roll Covering dept. The machine was set up in a new building along with other equipment to increase production of the department.*

Won't Hurt U.S. Markets

"These developments," he assures, "do not presage the drying up of what is now a good export market. A prosperous customer with a high standard of living offers infinitely more business opportunities than does a relatively poor customer with an almost purely agricultural economy."

With improved transportation into the interior, with populations increasing, and with governments in power which now think in terms of international economy rather than in narrow economic isolationism, Mr. Harrison believes that the field for United States designed products can do nothing other than expand. "The vast market potential, especially in such forward-thinking countries as the Argentine, Brazil, Chile and Peru is but barely realized in this country," he stated.

Must Import Machinery

"Right now, heavy machinery for the growth of South American industry must come from abroad, particularly from the United States. There is a market also for U. S. equipment to be used in the obvious but as yet largely undeveloped source of power—hydro electric."

Products which South American countries can export to United States manufacturers are largely limited at this time to raw materials, "a field which has been barely scratched despite the crying need for several years in this country for iron ore," Mr. Harrison said.

"One remedy which can be applied promptly to this situation is the introduction of U. S. capital, but only with the provision of proper safeguards to the interests of both parties," Mr. Harrison cautioned.

Need Technical Help

Along with financial help, Mr. Harrison advised, the South American countries need technical help, "in return for which northern manufacturers can automatically have a fair share of their trade." For many years, he noted, except for the sporadic efforts of England and a few other countries with industrial know-how, South America has been left to its own devices.

Skilled labor from Italy has been imported by Argentina to help accomplish much needed goals set by President Peron's five year plan, he said, but on the management, supervisory and higher technical level the U. S. is the logical source of this assistance. "The South Americans admire U. S. production techniques and want to adapt that which is applicable to their own economies."

More Prosperous, Stronger

"I see a more prosperous and stronger South America," Mr. Harrison stated, "if virile governments, backed by hard-working populations, obtain the needed additional assistance of American manufacturers with their production equipment, American technicians with their know-how, and the international banker with his venture capital.

"These three," he added "are now and always will be the most effective ambassadors building goodwill, reasonable profit, and inestimably valuable ties of friendship and mutual interest."

MAPI Economist Gives Business View on Profits

Business got a chance early this month to counterattack its critics on Capitol Hill. At the invitation of the joint Congressional committee on the Economic Report, George Terborgh of Machinery and Allied Products Institute presented the business viewpoint on the relationship between profits and capital expansion.

Mr. Terborgh said that the drive on allegedly excessive corporate profits was an attempt to curtail much delayed replenishment of our physical facilities of production.

Profits figures as currently being published are grossly excessive, he said, taking the 1948 figure of $21-billion as a case in point. To get a truer picture of actual profits, he suggested subtraction of:

(1) Between $3- and $4-billion—the higher cost of replacing in January, 1949, the inventory held at the beginning of 1948.

(2) $2-billion — the extra cost of replacing machinery carried on company books at original cost.

(3) $1-billion for depletion of resources.

"If we knock off four plus two plus one," he said, "we are down from $21-billion to $14- or $15-billion of legitimate operating profit."

Detroit

AUTOMOBILE SELLER'S MARKET FAST DISAPPEARING . . . COMPETITION FOR BUSINESS REQUIRES PRODUCT IMPROVEMENT, MORE TOOLING

The end of the winter finds the automobile picture far from the state of intense demand which existed last fall. The seller's market has quite definitely turned the corner. Virtually all makes of cars can be bought, with a little shopping around, right off a showroom floor.

This condition is likely to stiffen up very shortly, as soon as seasonal influences begin to play. Normally March sees about twice as many deliveries as the December-January-February average. More active buying through the balance of this month will clear out stocks which have been accumulating during the colder months. There will then exist at least a ghost of the seller's market which has prevailed through the postwar years—but only a ghost. The merry-go-round is slowing down.

Competition to Speed Production

The major implication for the long term is that competition for business will speed up product improvement. The 1941-48 period, when the auto industry as a whole did no more than face-lift its grillework, will not be repeated. From here on out, the necessities of merchandising being what they will be, yearly model changes will again be in order.

Another implication is this: more intense competition for business means that costs will have to be shaved. With labor rates in the high ground they are, this means more intensive tooling. One production expert in the industry believes that it will soon be realized that about $10,000 in plant equipment is needed for every man on the factory payroll—close to double the previous ratios of this sort.

It means, also, that the search will be intensified for lower-priced automobiles. One tentative stab in this direction is noted at Chrysler Corp., with its shorter-wheelbase jobs in the Plymouth and Dodge lines. Somewhat more was taken out of these jobs than simply a few inches of frame and chassis. Short-cuttings can be noticed in teardown of these new jobs—the kind of revisions which reduce production operations, and hence cut costs in the way that is important.

Cost-Cutting Hardly Felt

Nevertheless, the effect of this cost-cutting can hardly be felt at Chrysler, or elsewhere. One reason: continually increased costs for steel. One Detroit-based company has figured that the shift in steel prices to a mill city f.o.b. basis has added an actual $12.64 to the cost of each car it makes. This same company says that recently added extras on steel quotations amount to no less than $26.13 per car.

***THE NEW YORKER.** Chrysler four-door sedan, introduced to the public today. Rear seat cushion is seven inches and front seat cushion six inches wider than in preceding models. A sponge rubber safety cushion is placed directly above instrument panel to protect front-seat passengers in event of a sudden stop.*

Industry reaction to the newly introduced Chrysler lines, it should be noted, has been highly interesting. These new models were changed less, appearance-wise, than the postwar jobs of any other company. Inside Autodom there is a polite wonderment as to why Chrysler did not take its $90-million tooling expenditure and apply it to achieve more pronounced style changes. Some belief along this line is that if real selling competition returns to the auto industry, the Chrysler lines may have to be revamped again—which would mean business for equipment manufacturers.

Choice of Two Styling Types

Whether this is true or not, it is a fact that now the public has its choice of two types of styling—the advanced, pontoon-sided, low-slung effect which is typical of most of the industry; and the comparatively conservative, separate-fendered, higher appearing Chrysler products. If the public goes for either one in marked preference over the other, certainly there will be some new die programs put onto the drawing boards—but fast.

The current slackening in auto demand has been most notable at Kaiser-Frazer, where a January of split work-weeks was followed by a 3-week shutdown during the latter stages of February. At the same time, K-F announced a $200 "trading discount" for its dealers up through Mar. 31, when selling discounts will be increased. The "trading discount" is a bonus for each car sold by the dealer on which a reorder is placed with the factory. Before the war such discounts of $25 were often offered by companies for trade-ins which went to junk, but moves above that level were unsual.

Gossip has it that recent shutdowns at Hudson, credited to parts shortages and subsequently to production line slowdowns, and at Lincoln, attributed to parts shortage, might stem at least in part from slackened field demand. Willys also had a 2-day shutdown to redistribute Jeeps which failed to move to storm-stricken western areas. Many more companies, including both independents and major producers in the big three, have been accumulating field inventory during the slack winter months.

Total Volume Maintained

Expectations that this inventory float will be worked off as soon as spring arrives are obvious in the fact that the industry's total volume has maintained itself steadily. Output has largely ranged in the neighborhood of 110,000 units a week, cars and trucks, U.S. and Canadian combined. Chrysler divisions have been steadily enlarging their totals after their model changeover shutdowns, helping balance off the sporadic reductions elsewhere in the list.

Looking ahead, Ford expects to advance production from a current 4,000-a-day clip up to 4,250 or 4,340 sometime after the end of the first quarter. Mercury, too, may be advanced about 10 percent from its present schedules of 700-a-day, starting May 1.

Names in the News

John C. Wilson has been elected to the board of directors and named vice president in charge of sales and engineering, Thompson Grinder Co., Springfield, Ohio.

Leo F. Fowler has been appointed factory superintendent of Universal Products Co., Inc., Dearborn, Mich. Other appointments: **George F. Brown,** master mechanic; **Melvin S. Stern,** planning superintendent.

Glen S. Potter has been appointed service manager of Hudson Motor Car Co., Detroit.

Charles M. Wheeler has been appointed general sales manager of The Union Switch and Signal Co., Swissvale, Pa.

Leonard R. Shorek has been named chief engineer of Young Brothers Co., Detroit. **James D. Russel** has been named sales manager.

George M. Hoover has been made quality-control head of Crosley Motors, Inc., Cincinnati.

William Clay Ford, graduated last month from Yale University, will join Ford Motor Co., Dearborn, Mich., this month to spend time in each of the staff and operating divisions before becoming assigned permanently.

R. F. V. Stanton

R. F. V. Stanton, vice president in charge of manufacturing of American Machine and Foundry Co., New York, has been elected a member of the board of directors. He became associated with AMF as vice president in charge of production in the early part of 1948 after more than 30 years with the Pratt & Whitney Division of Niles-Bement-Pond Co., Hartford, Conn.

John S. Conant has been appointed director of procurement for Willys-Overland Motors, Inc., Toledo, Ohio.

Richard J. Hill has been appointed sales engineer in the New York metropolitan area for Sterling Injection Molding, Inc., Buffalo.

Elwood A. Rose has been named production supervisor and **Benjamin F. Poduska** has been named plant manager of The Glenn L. Martin Company's chemicals plant, Painesville, Ohio.

Miles K. Smith

Miles K. Smith has been appointed vice president and technical director of Jessop Steel Co., Washington, Pa. He was formerly with the Molybdenum Corp. of America in a technical sales capacity, and prior to that he was employed for many years by the Latrobe Electric Steel Co. in the production of tool steels.

W. C. Schade has been appointed manager of product divisions, Olin Industries, Inc., East Alton, Ill.

John T. McHugh has been appointed department superintendent of the nail mill at the Donora, Pa., Steel and Wire Works of American Steel and Wire Co., U. S. Steel subsidiary.

E. Y. Wolford has been named manager of plastics development, Chemical Division, Koppers Co., Inc., Pittsburgh.

M. Dickinson has been appointed a field service engineer for The Bassick Co., Bridgeport, Conn.

Harrie T. Shea has been elected president of Star Electric Motor Co., Bloomfield, N. J.

John M. Dolan

John M. Dolan has been appointed vice president in charge of sales, The Hydraulic Press Manufacturing Co., Mt. Gilead, Ohio. He was formerly vice president of the LeRoi Co., Milwaukee, and for thirteen years previously was connected with Sullivan Machinery Co., Michigan City, Indiana, for several years as manager of the Compressor Division.

Kempton Dunn has been elected vice president and **Cyrus E. Brush** elected secretary of American Brake Shoe Co., New York.

Harold F. Mosher has been named manager of the Dallas district of the Industrial Products Sales dept., B. F. Goodrich Co.

Newman L. Smith has been elected president of Airquipment Co., and its subsidiary, Aerol Co., Inc., Burbank, Calif.

James W. Reynolds

James W. Raynolds has been named sales manager for silicone products, Chemical Dept., General Electric Co., Pittsfield, Mass.

P. A. Collins

P. A. Collins has been appointed chief assistant engineer in charge of production and experimental engineering, Chevrolet Motor Division, General Motors Corp., Detroit. **R. J. Waterbury** has been named chief assistant engineer in charge of design—executive and administrative engineering for Chevrolet.

C. Harold Phillips

C. Harold Phillips has been appointed plant manager of the Fort Wayne plant, Essex Wire Corp.

Avery C. Adams has been named vice president of Portsmouth Steel Corp., Portsmouth, Ohio.

A. S. Trivison has been appointed to the board of directors of The Columbian Vise and Manufacturing Co., Cleveland. **Robert F. Swander** has been named treasurer, and Richard Seymour, secretary.

William J. Joyce, Jr., has been appointed administrator of research and development, The Wayne Pump Co., Fort Wayne, Ind.

Walter D. Appel has been appointed vice president of engineering for the newly-formed Ford International Co., Dearborn, Mich. He was formerly with General Motors and with Willys-Overland Motors.

Dr. G. V. Slottman has been appointed director of research and engineering for Air Reduction Co., New York. He has been closely associated with Air Reduction's development and introduction of steelmaking processes using oxygen for both combustion purposes and as a chemical reagent.

O. W. Young, general manufacturing manager of Buick Division, General Motors Corp., has been named executive assistant to **Ivan L. Wiles,** vice president of GM and general manager, Buick Division. **E. T. Ragsdale** was appointed general manufacturing manager. **Harry C. Doane** and **Richard C. Cook** have been named assistant chief engineers.

BUSINESS ITEMS

Kenmore Metals Corp. is increasing plant capacity approximately four times through acquisition of a long term lease on part of the property formerly occupied by American Brake Shoe Foundry, Jersey City, N. J.

United Brass and Aluminum Co., Port Huron, Mich., has been purchased by Muskegon Foundry Supply Co., Muskegon, Mich., from Gray Marine Motor Co., Detroit.

Industrial Cold Co., Detroit, has been formed by Charles Earl and Ed Kellie to produce low temperature mechanically refrigerated cabinets for industrial and laboratory applications.

Kennametal Inc., Latrobe, Pa., has under way a $200,000 expansion program which includes erection of a new building and an addition to the laboratory.

Acro Electric Co., Cleveland, has changed its name to Acro Switch Co.

Continental Die Casting Corp., a division of F. L. Jacobs Co., Detroit, is now in production on 25 different die cast, chrome plated ornamental hardware parts for 1949 Chrysler Corp. cars.

Terry Machine Co., Cleveland, has been organized by C. R. Terry as a sales agency for metalworking machinery.

The Schaible Co., Cincinnati, has acquired the business, plant and all facilities of D. T. Williams Valve Co., Cincinnati.

Cornell-Dubilier Electric Corp., South Plainfield, N. J., has opened a Midwest direct factory sales office at 605 N. Washington Ave., Chicago, under the supervision of Charles H. Caine, vice president.

Devoe & Raynolds Co., Inc., New York, is building a synthetic resin plant on recently acquired property in Los Angeles.

Taylor Manufacturing Co., Milwaukee, Wisc., has changed its name to Wright Manufacturing Co., with offices in Houston, Texas. The company is building a $2,000,000 plant in Houston.

Peerless Metal Processing Co., Vancouver, B. C., has been organized as a partnership by J., D., and S. Berman.

The Cleveland Crane & Engineering Co., Wickliffe, Ohio, has been purchased outright by The McNeil Machine & Engineering Co., Akron, Ohio.

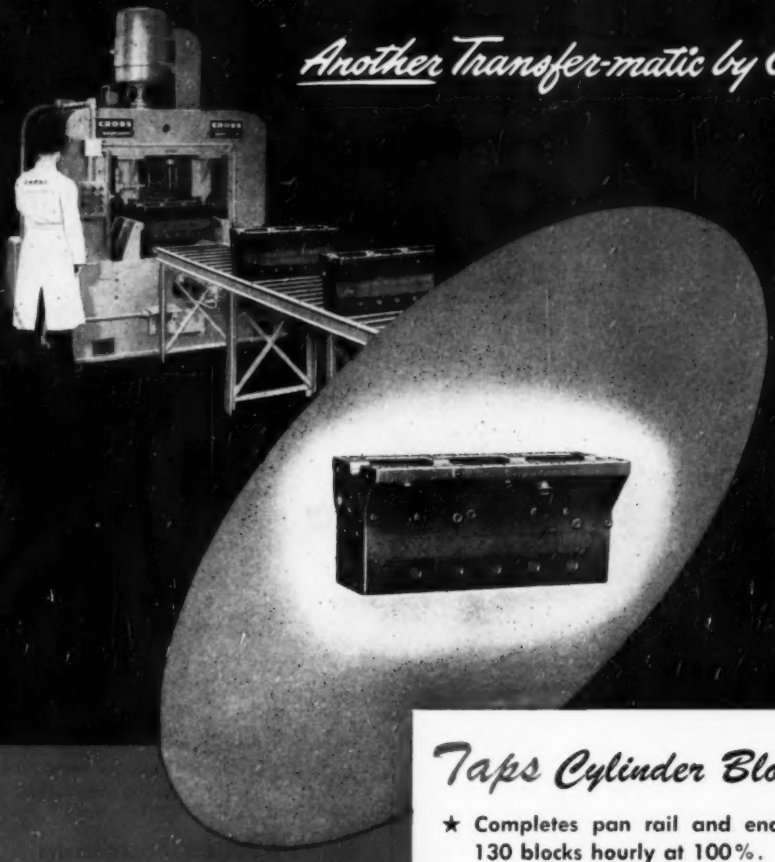
OBITUARIES

Ertie L. Foreman, 55, manager of the Los Angeles office of Whitman & Barnes, Detroit, a division of United Drill and Tool Corp., died of a heart attack February 9.

Harry F. Bower, vice president and general manager of the Buckeye Forging Co., Cleveland, died Feb. 19 in Chicago, where he was attending the meeting of the Association of Drop Forge Men.

HUGO L. OLSON, late president of Sundstrand Machine Tool Co., Rockford, Ill. His death on Jan. 31, at 71 years of age, was reported in American Machinist, Feb. 24.

Another Transfer-matic by Cross



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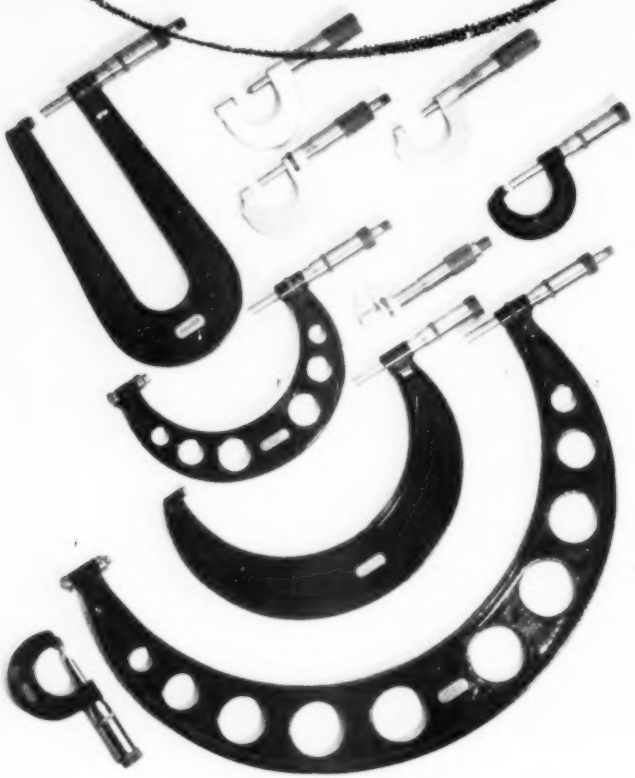

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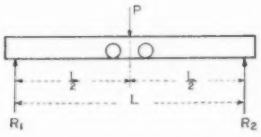


The data tabulated below indicate the size of American Standard I-beams required for applications falling into two categories:

1. Single-trolley, single-girder, overhead traveling bridge cranes.

2. Single-trolley, monorail installations with supporting points on center distances equal to the given span.

For a given load and span, beam size may be determined directly from the table. Recommendations include a factor of safety of five.

The first step was to determine the maximum bending moments that must be resisted by the girder. Included were moments set up by both the dead load (weight of girders) and the maximum load to be imposed upon the girder. Then, the girder section was designed to resist the maximum bending moment, with suitable factor of safety, and without undue deflection when under capacity load.

The formula below covers conditions encountered in single-trolley single-girder bridges:

Where, $M_B = \frac{P \times L}{4} + \frac{GL}{8}$

M_B = Max. bending moment (in.lb.)
P = Live load (trolley plus load)
L = Span (in.)
G = Dead load (weight of girder, shaft and brackets) (lb.)

After the girder was determined, it was necessary to prove its suitability. This was done by computing the properties of the girder and determining the stresses set up in it both in tension and compression. Given below are the maximum allowable stresses that practical crane-building experience has demonstrated to be correct.

Maximum allowable stress $= \frac{20{,}000}{L + \frac{L^2}{2000b^2}}$

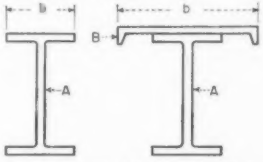
where, L = Span (in.)
b = Width of flange (in.)

In crane girders it is also desirable to distribute weight over as much width as practical because of the greater lateral stability obtained. A guide to proper lateral stiffness is the $\frac{L}{b}$ ratio, below. Where necessary to give maximum strength and stability with minimum weight, a rolled steel channel is welded to the top of the I-beam flange.

Maximum $\frac{L}{b} = 30$, for hand-operated cranes

Maximum $\frac{L}{b} = 50$, for electric cranes

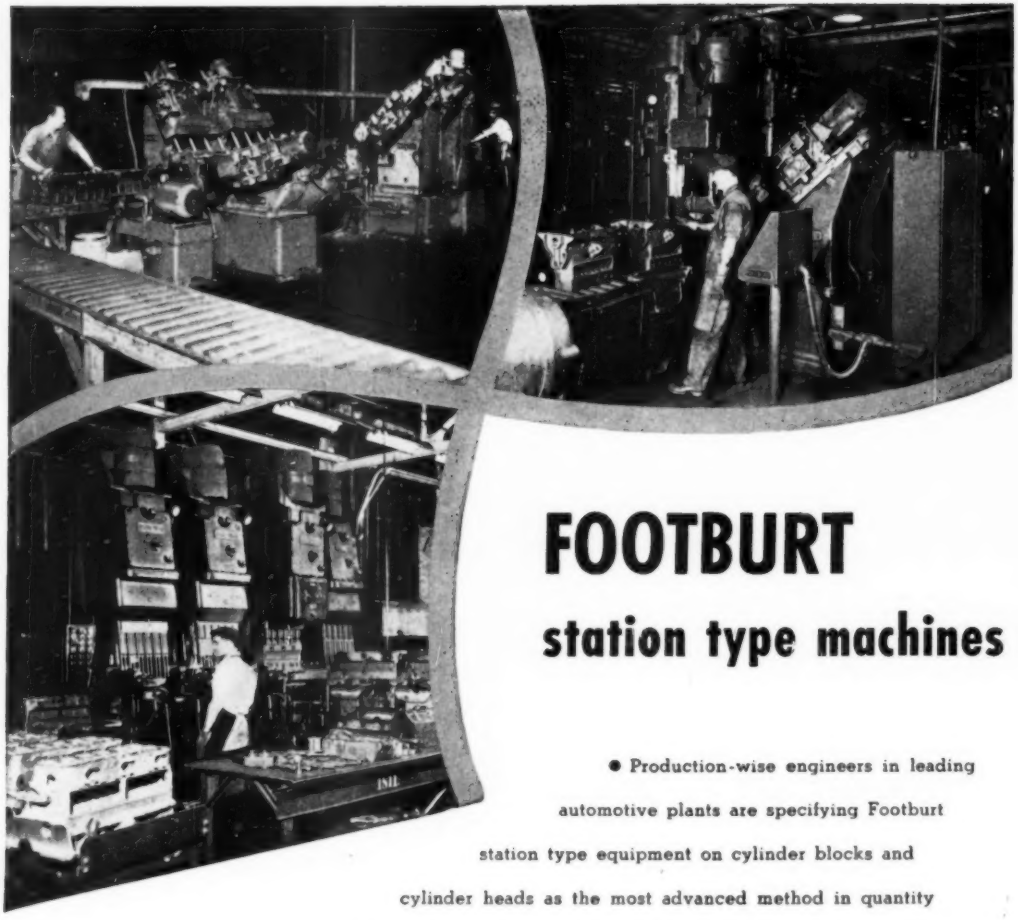
A = main girder size, American Standard I-beam.
B = reinforcing channel.



The following data apply only to monorails with structural I-beam characteristics, and the recommended sizes are based upon the listed hoist capacity including the weight of the trolley, as well as the weight of the load.

I-BEAM SIZES RECOMMENDED FOR CRANE AND MONORAIL APPLICATIONS

CAPACITY TONS		SPAN 12′- 0″	15′- 0″	17′- 6″	20′- 0″	22′- 6″	25′- 0″	27′- 6″	30′- 0″	35′- 0″	40′- 0″
¼	A	8″-18.4#	8″-18.4#	8″-18.4#	8″-18.4#	10″-25.4#	10″-25.4#	10″-25.4#	10″-25.4#	12″-31.8#	12″-31.8#
½	B	—	—	—	—	—	—	—	—	8″-11.5#	8″-11.5#
1	A	8″-18.4#	8″-18.4#	10″-25.4#	10″-25.4#	12″-31.8#	12″-31.8#	12″-31.8#	12″-31.8#	12″-31.8#	12″-31.8#
	B	—	—	—	—	—	—	—	7″- 9.8#	9″-13.4#	10″-15.3#
2	A	8″-18.4#	10″-25.4#	10″-25.4#	12″-31.8#	12″-31.8#	12″-31.8#	15″-42.9#	15″-42.9#	15″-42.9#	15″-42.9#
	B	—	—	—	—	—	—	—	9″-13.4#	9″-13.4#	10″-15.3#
3	A	10″-25.4#	12″-31.8#	12″-31.8#	12″-31.8#	15″-42.9#	15″-42.9#	18″-54.7#	15″-42.9#	15″-42.9#	15″-42.9#
	B	—	—	—	—	—	—	—	9″-13.4#	10″-15.3#	12″-20.7#
4	A	12″-31.8#	12″-31.8#	15″-42.9#	15″-42.9#	15″-50#	18″-54.7#	18″-54.7#	18″-54.7#	18″-54.7#	18″-54.7#
	B	—	—	—	—	—	—	—	10″-15.3#	10″-15.3#	12″-20.7#
5	A	12″-31.8#	15″-42.9#	15″-42.9#	15″-42.9#	18″-54.7#	18″-54.7#	20″-65.4#	18″-54.7#	18″-54.7#	18″-54.7#
	B	—	—	—	—	—	—	—	10″-15.3#	12″-20.7#	12″-20.7#
6	A	15″-42.9#	15″-42.9#	15″-42.9#	18″-54.7#	18″-54.7#	20″-65.4#	24″-79.9#	18″-54.7#	10″-65.4#	24″-79.9#
	B	—	—	—	—	—	—	—	10″-15.3#	12″-20.7#	12″-20.7#
8	A	15″-42.9#	18″-54.7#	18″-54.7#	18″-54.7#	20″-65.4#	20″-65.4#	24″-79.9#	20″-65.4#	24″-79.9#	24″-79.9#
	B	—	—	—	—	—	—	—	12″-20.7#	12″-20.7#	25″-33.9#
10	A	15″-42.9#	18″-54.7#	20″-65.4#	20″-65.4#	24″-79.9#	24″-79.9#	24″-79.9#	24″-79.9#	24″-79.9#	24″-79.9#
	B	—	—	—	—	—	—	12″-20.7#	12″-20.7#	15″-33.9#	15″-33.9#



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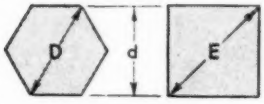
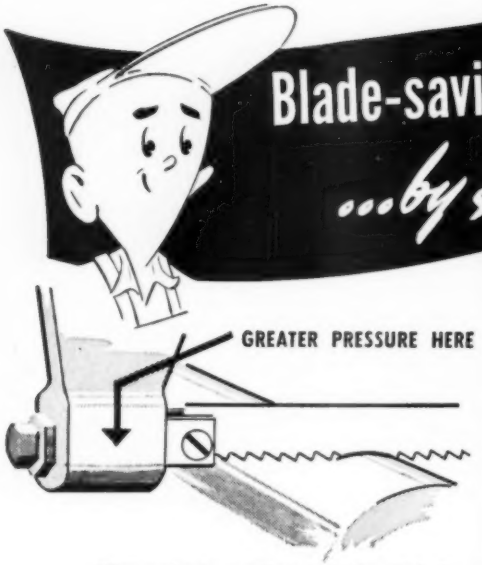


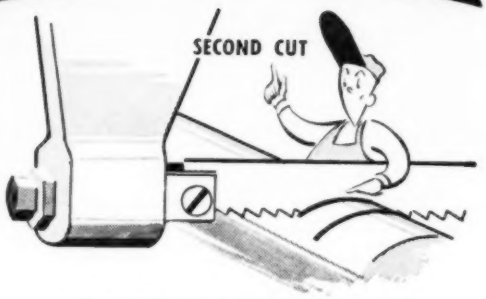
$D = 1.1547\ d$
$E = 1.4142\ d$

d	D	E	d	D	E	d	D	E
1/4	0.2886	0.3535	1 1/4	1.4434	1.7677	2 5/16	2.6702	3.2703
9/32	0.3247	0.3977	1 9/32	1.4794	1.8119	2 3/8	2.7424	3.3587
5/16	0.3608	0.4419	1 5/16	1.5155	1.8561	2 7/16	2.8145	3.4471
11/32	0.3968	0.4861	1 11/32	1.5516	1.9003	2 1/2	2.8867	3.5355
3/8	0.4329	0.5303	1 3/8	1.5877	1.9445	2 9/16	2.9583	3.6239
13/32	0.4690	0.5745	1 13/32	1.6238	1.9887	2 5/8	3.0311	3.7123
7/16	0.5051	0.6187	1 7/16	1.6598	2.0329	2 11/16	3.1032	3.8007
15/32	0.5412	0.6629	1 15/32	1.6959	2.0771	2 3/4	3.1754	3.8891
1/2	0.5773	0.7071	1 1/2	1.7320	2.1213	2 13/16	3.2476	3.9794
17/32	0.6133	0.7513	1 17/32	1.7681	2.1655	2 7/8	3.3197	4.0658
9/16	0.6494	0.7955	1 9/16	1.8042	2.2097	2 15/16	3.3919	4.1542
19/32	0.6855	0.8397	1 19/32	1.8403	2.2539	3	3.4641	4.2426
5/8	0.7216	0.8839	1 5/8	1.8764	2.2981	3 1/16	3.5362	4.3310
21/32	0.7576	0.9281	1 21/32	1.9124	2.3423	3 1/8	3.6084	4.4194
11/16	0.7937	0.9723	1 11/16	1.9485	2.3865	3 3/16	3.6806	4.5078
23/32	0.8298	1.0164	1 23/32	1.9846	2.4306	3 1/4	3.7527	4.5962
3/4	0.8659	1.0606	1 3/4	2.0207	2.4708	3 5/16	3.8249	4.6846
25/32	0.9020	1.1048	1 25/32	2.0568	2.5190	3 3/8	3.8971	4.7729
13/16	0.9380	1.1490	1 13/16	2.0929	2.5632	3 7/16	3.9692	4.8613
27/32	0.9741	1.1932	1 27/32	2.1289	2.6074	3 1/2	4.0414	4.9497
7/8	1.0102	1.2374	1 7/8	2.1650	2.6516	3 9/16	4.1136	5.0381
29/32	1.0463	1.2816	1 29/32	2.2011	2.6958	3 5/8	4.1857	5.1265
15/16	1.0824	1.3258	1 15/16	2.2372	2.7400	3 11/16	4.2579	5.2149
31/32	1.1184	1.3700	1 31/32	2.2733	2.7842	3 3/4	4.3301	5.3033
1	1.1547	1.4142	2	2.3094	2.8284	3 13/16	4.4023	5.3917
1 1/32	1.1907	1.4584	2 1/32	2.3453	2.8726	3 7/8	4.4744	5.4801
1 1/16	1.2268	1.5026	2 1/16	2.3815	2.9168	3 15/16	4.5466	5.5684
1 3/32	1.2629	1.5468	2 3/32	2.4176	2.9610	4	4.6188	5.6568
1 1/8	1.2990	1.5910	2 1/8	2.4537	3.0052	4 1/8	4.7631	5.8336
1 5/32	1.3351	1.6352	2 5/32	2.4898	3.0494	4 1/4	4.9074	6.0104
1 3/16	1.3712	1.6793	2 3/16	2.5259	3.0936	4 3/8	5.0518	6.1872
1 7/32	1.4073	1.7235	2 1/4	2.5981	3.1820	4 1/2	5.1961	6.3639

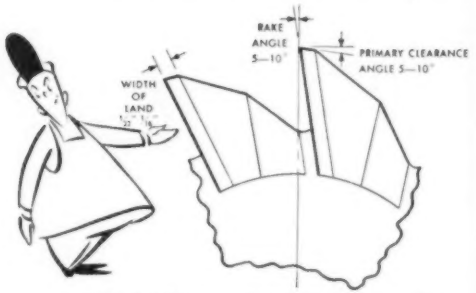
Blade-saving hints for sawing ...by Stainless Sam



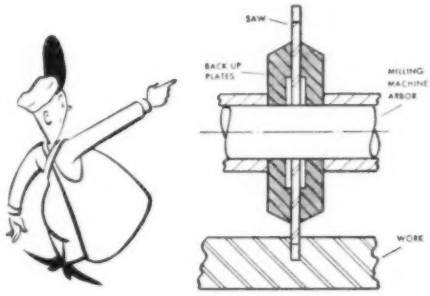
1 When sawing large sections of Stainless Steel, the use of a heavy-duty power hacksaw is recommended. Stainless Sam says that reduced speeds and increased feeds is a good general rule to follow when sawing Stainless Steels.



2 When a blade fails, *start a new cut* with a new blade because the metal has been work-hardened by the old blade. The new blade should not be guided into the same groove. If large quantities must be sawed, longer blade life can be obtained by changing from a water-soluble to a sulfur-base oil.



3 Teeth should be properly backed off when sawing Stainless Steels with high speed steel circular saws. The larger the cutter the smaller the clearance angle. Coarse tooth saws with staggered teeth are recommended for deep, wide cuts. Fine tooth saws should be used for light sections.



4 Whenever possible, flanges should be mounted on each side of the saw to stiffen the blade. Stainless Sam recommends a set-up similar to this outline sketch. Diameters of the flanges should be as large as the depth of cut will permit.

Sawing Stainless Steels is only one of many subjects discussed in Armco's valuable new booklet on machining.

Write for your copy today. It may surprise you to know how easy it is to machine ARMCO Stainless Steels with standard equipment.

And you may be in line for another pleasant surprise if you make a cost-study of each part of your product—comparing Stainless with the material you are using now.

When you write for a copy of the booklet, just ask for "Machining of ARMCO Stainless Steels." Address Armco Steel Corporation, 140 Curtis Street, Middletown, Ohio.

Export: The Armco International Corporation

ARMCO STAINLESS STEELS

ARMCO

Work or Tool Rpm. for Cutting Speeds from 40 to 1000 Sfpm.

COURTESY GORHAM TOOL COMPANY

Example: Desired Surface Speed in Feet per Minute = 80
Diameter of Cutter = 1¼
Spindle rpm = 244

Tool or Work Dia. (Inches)	SURFACE FEET PER MINUTE																			
	40	50	60	70	80	90	100	125	150	175	200	250	300	400	500	600	700	800	900	1000
1/16	2445	3056	3667																	
1/8	1222	1529	1833	2139	2445	2750	3056													
3/16	815	1019	1222	1426	1630	1833	2037	2544	3056	3565										
1/4	611	764	917	1070	1222	1375	1528	1908	2292	2674	3056									
5/16	489	611	733	856	978	1100	1222	1526	1833	2139	2444	3056								
3/8	407	509	611	713	815	917	1019	1272	1528	1783	2036	2547	3056							
7/16	349	437	524	611	698	786	873	1090	1310	1528	1748	2183	2619	3492						
1/2	306	382	458	535	611	688	764	954	1146	1337	1528	1910	2292	3056						
5/8	244	306	367	428	489	550	611	763	917	1070	1224	1528	1834	2445	3056					
3/4	204	255	306	857	407	458	509	636	764	891	1016	1273	1528	2037	2547	3053	3565			
1	153	191	229	267	306	344	382	477	573	668	764	955	1146	1528	1910	2292	2674	3056	3438	
1 1/4	122	153	183	214	244	275	306	382	458	535	612	764	917	1222	1528	1832	2139	2445	2750	3056
1 1/2	102	127	153	178	204	229	255	318	382	445	510	637	764	1019	1273	1527	1783	2037	2292	2547
1 3/4	87	109	131	153	175	196	218	273	327	382	436	546	655	873	1091	1308	1528	1746	1964	2183
2	76	96	115	134	153	172	191	239	287	334	382	477	573	764	955	1145	1337	1528	1719	1910
2 1/4	68	85	102	119	136	153	170	212	255	297	340	424	509	679	849	1018	1188	1358	1528	1698
2 1/2	61	76	92	107	122	138	153	191	229	268	306	382	458	612	764	916	1070	1222	1375	1528
2 3/4	56	70	83	97	111	125	139	174	208	243	278	347	417	556	694	833	972	1111	1250	1389
3	51	64	76	89	102	115	127	159	191	223	255	318	382	510	637	763	891	1019	1146	1273
3 1/4	47	59	71	82	94	106	118	147	176	206	234	294	353	470	588	705	823	940	1058	1175
3 1/2	44	55	66	76	87	98	109	136	164	191	218	273	328	437	546	654	764	873	982	1091
3 3/4	41	51	61	71	82	92	102	127	153	178	204	255	306	407	509	611	713	815	917	1019
4	38	48	57	67	76	86	96	119	143	167	191	239	287	382	478	572	668	764	859	955
4 1/2	34	42	51	59	68	76	85	106	127	149	170	212	255	340	425	509	594	679	764	849
5	31	38	46	54	61	69	76	96	115	134	153	191	229	306	382	458	535	611	688	764
5 1/2	28	35	42	49	56	63	70	87	104	122	139	174	209	278	348	416	486	556	625	695
6	25	32	38	45	51	57	64	80	96	112	127	159	191	255	319	382	446	509	573	637
6 1/2	23	29	35	41	47	53	59	74	88	103	118	147	176	235	294	352	411	470	529	588
7	22	27	33	38	44	49	55	68	82	96	109	136	164	218	273	327	382	436	491	546
7 1/2	20	26	31	36	41	46	51	64	76	89	102	127	153	204	255	305	356	407	458	509
8	19	24	29	33	38	43	48	60	72	84	95	119	143	191	239	286	334	382	430	478
8 1/2	18	23	27	32	36	40	45	56	67	78	90	112	135	180	225	269	315	359	404	449
9	17	21	26	30	34	38	42	53	64	74	85	106	127	170	212	254	297	339	382	424
9 1/2	16	20	24	28	32	36	40	50	60	70	80	100	121	161	201	241	281	322	362	402
10	15	19	23	27	31	34	38	48	57	67	76	95	115	153	191	229	267	306	344	382
11	14	17	21	24	28	31	35	43	52	61	69	87	104	139	174	208	243	278	312	347
12	13	16	19	22	26	29	32	40	48	56	64	79	96	127	159	191	223	255	286	318
13	12	15	18	21	23	26	29	37	44	51	59	73	88	117	147	176	206	235	264	294
14	11	14	16	19	22	24	27	34	41	48	55	68	82	109	136	163	191	218	245	273
15	10	13	15	18	20	23	25	32	38	44	51	64	76	102	127	153	178	204	229	255
16	9	12	14	17	19	21	24	30	36	42	48	60	72	95	119	143	167	191	215	239
17	9	11	13	16	18	20	22	28	34	39	45	56	67	90	112	135	157	180	202	225
18	8	11	13	15	17	19	21	26	32	37	42	53	64	85	106	127	148	170	191	212

DIVIDEND NOTICE

The directors of your manufacturing company announce the regular quarterly dividend of 10% payable to stockholders of record . . .

Model 601 Model 86 Model 37 Model 63

40% annual return on an investment in New Britain Automatics is commonplace

REPLACEMENT of old machines (even those in good working condition) with New Britain modern automatics frequently shows this or greater return on the basis of direct labor savings alone . . . with substantial extra dividends in overhead, recovery on equipment replaced and other factors.

The peculiar fact about modern machine tools as an investment is that the person who fails to make the investment is the one who runs the risk, because he endangers his ability to compete successfully.

Have you examined your equipment from this viewpoint recently? It's a simple process. Your New Britain representative with the help of our Estimating Department is available to assist you in analyzing your own machine replacement program.

We know you would benefit by having a talk with any one of the following sales engineers. Write, wire or call collect:

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New Britain, Connecticut

Mr. F. H. Hastings
1853 Bluefield Place
Cincinnati 16, Ohio

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New York, New York

Mr. J. J. Barry
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Shop Equipment News

R. K. LeBlond Contouring Attachment Is Hydraulic for Heavy-Duty Lathes

A hydraulic attachment for shaft and profile contouring that can be installed in the field without drilling or fitting on LeBlond heavy-duty lathes is announced by R. K. LeBlond Machine Tool Co., Cincinnati 8, Ohio. The "Hydra-Trace" accommodates stock to the full swing capacity of the lathe and does not interfere with cross-slide travel or prevent the use of the taper attachment.

The Hydra-Trace is available in six sizes to fit LeBlond heavy-duty engine, RT series engine and toolroom, plain- and sliding-bed gap, and Rapid Production lathes. The attachment can be added to any of these lathes built since 1935.

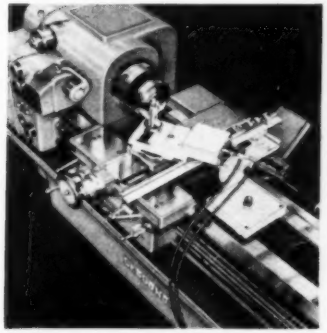
A special compound rest, interchangeable with the regular compound rest in a matter of minutes, mounts the Hydra-Trace. Both between-centers duplicating and profile facing are handled, and the shift between the two is quickly made.

The Hydra-Trace, operating on the templet-actuated stylus principle, brings automatic stepless contouring to the standard lathe. It will perform the complete range of operations, including straight facing and turning, tapers of any kind, shoulders, necking, concave and convex surfaces, and spherical surfaces. A stylus-control metering device is built directly into the compound rest. Diameters are adjusted by the lathe crossfeed screw with feeds selected directly through the regular feed box.

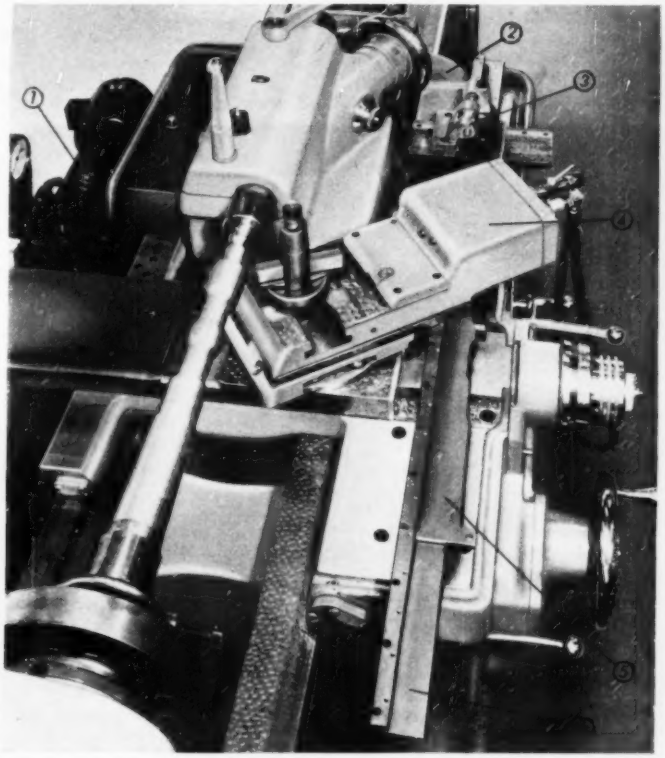
Only five parts are required: tracer slide, templet, templet carrier, bed bracket, and hydraulic tank and pump. It is claimed that lathe operators grasp the principle quickly and can learn to handle it in a few minutes.

Templet holder and controls are located on the front of the lathe with no overhanging brackets or controls in the rear. The T-slot on the tracer slide will take any standard or four-way toolblock, and the slide may be swiveled to give the most favorable angle for tool clearance.

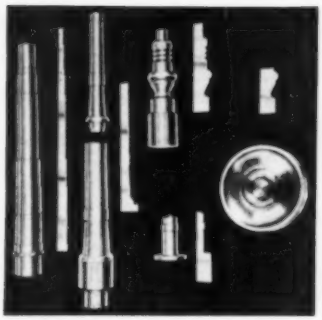
The 16-in. size has 3-in. top slide



PROFILE FACING arrangement of the Hydra-Trace. Bed bracket is designed not to interfere with taper attachment



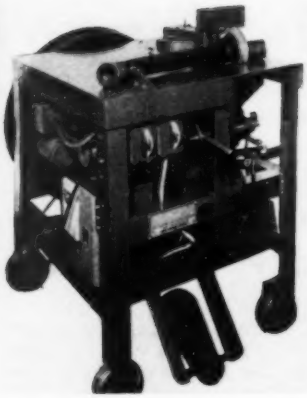
BETWEEN-CENTERS duplicating with the Hydra-Trace. Tank and pump (1) are at rear of machine. Other parts are: (2) bed bracket, (3) micrometer length adjustment, (4) tracer slide, (5) templet, and (6) templet carrier



FLAT TEMPLETS used with the Hydra-Trace and shaft and profile tracing jobs made from them

travel and shaft diameters can be reduced from 4¼ to 6 in. by varying the angle setting of the tracer slide. On a standard 16-in. heavy-duty engine lathe, shaft and profile facing jobs up to 20½-in. dia. can be handled.

An electric duplicating attachment was introduced last year for Regals and Dual Drives (the light- and medium-duty lathes). Every LeBlond lathe can now be fitted for automatic contouring.



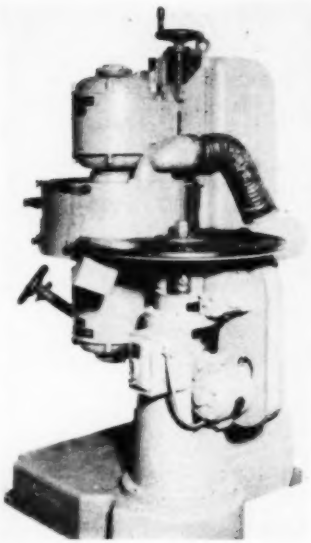
Automatic Strapping Machine Serves Production and Shipping

A fully automatic power-strapping machine, Type 3A, has been developed by Signode Steel Strapping Co., 2600 N. Western Ave., Chicago 47, Ill. The operator positions the item to be strapped and starts the cycle by pressing a pedal.

Encirclement with the correct amount of strap is automatic. The strap is tightened to a pre-set amount of tension (which can be adjusted), the seal is applied, and the strap is cut to complete the cycle. No resetting is necessary.

The fast, automatic operation of this machine makes it suitable not only for quantity strapping in material handling and shipping operations, but for assembly work in certain types of manufacturing operations.

SPECIAL MACHINE features double-loading enabling increased output of water-pump bodies. Parts are milled, drilled, bored, reamed, and tapped at the rate of 90 pieces per hr. with one unskilled operator. Made by Cross Co., Detroit, Mich., the machine is loaded with a new water-pump body at the beginning of each cycle and a semi-finished part is transferred from the first to the second position. Second-operation is simultaneous with first chucking

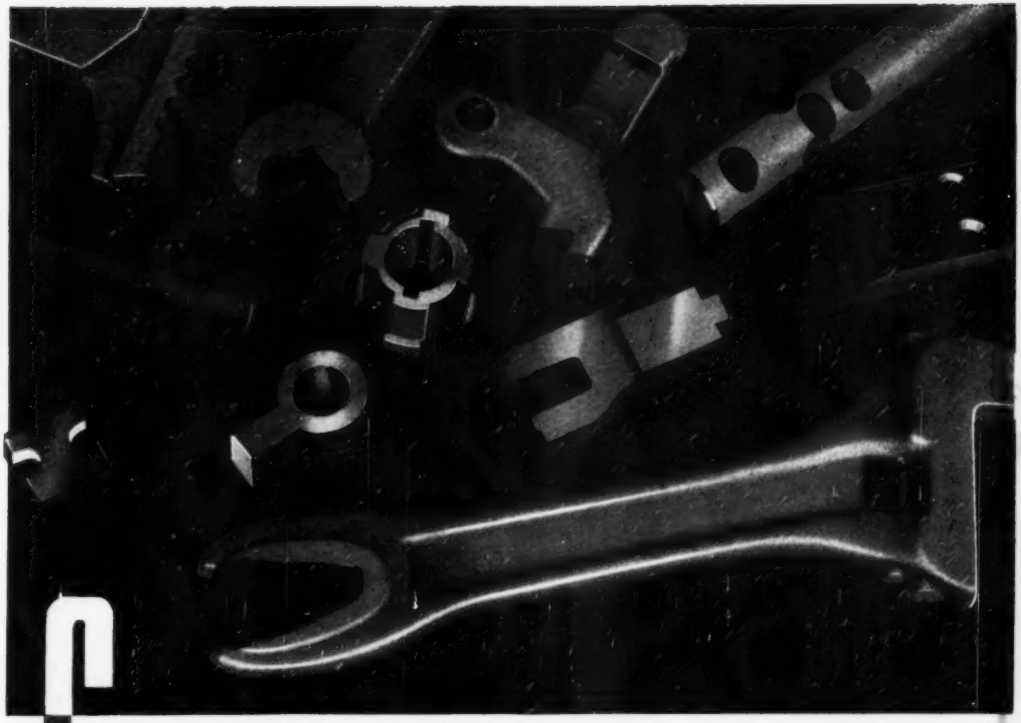


Besly Double Vertical Grinder Precision Grinds Small Parts

A double vertical spindle grinder for precision grinding of small parts is announced by Charles H. Besly and Co., 118-124 N. Clinton St., Chicago 6, Ill. The machine grinds wet or dry as fast as the work can be loaded.

With manual loading by a skilled operator, the No. 905 has an output of 2400 pieces per hour. With hopper feed it may run 5000 or more pieces per hour. Fast gravity loading and unloading are provided by the horizontal position of the feed wheel. The grinder can be converted from one job to another by replacing the feed wheel.

The grinder will handle production grinding on coil-spring ends, carbon brushes, and a variety of other small parts. Two 3-hp. motors, 1750 rpm., are provided for the grinding heads. The grinder may be equipped with 15-, 16-, or 18-in. dia. abrasive disks. Overall length and width are 41⅞ in. and height is 66 in.



CONTOURS - *Simple* OR *Intricate*

are Broached faster . . . for less

Increased production and uniformity of shape and tolerance are two of the most important advantages of contour broaching. Another is the surface finish of the part after broaching . . . usually suitable for final assembly.

In addition, there are great savings in tooling costs and maintenance. All but the simplest forms are broached progressively by a series of broach inserts, each of which produces a part of the contour. This progressive-type tooling eliminates the expense of costly tools having the complete form. Further, because each insert has but the simplest form, usually round or flat, the cost of tool sharpening is greatly reduced. In the event that one insert is damaged, only that section need be replaced. Idle machine time is cut, too, because simple design increases tool life.

Shown above are but a few broached contours of the hundreds for which Detroit Broach has designed and built the tooling. We will gladly outline the advantages of broaching the contours of your parts . . . and give you cost and production data for each. Call your local Detroit Broach representative or write today.

DETROIT *Broach* COMPANY

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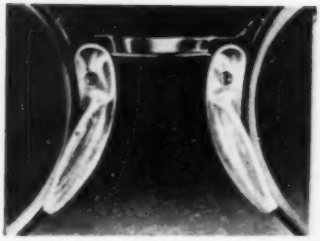
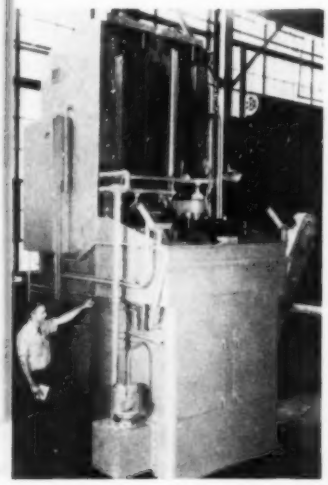
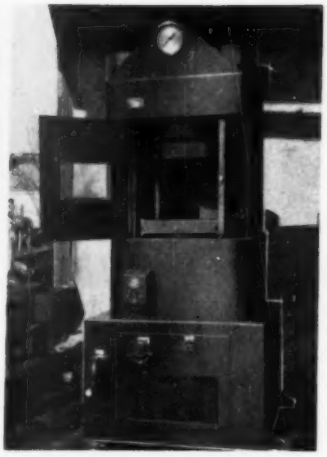


Cesco Spectacle-Type Goggles Feature Comfort-Bridge Pads

The Chicago Eye Shield Co., 2300 Warren Blvd., Chicago 12, Ill., offers a spectacle-type goggle which features the Comfort-Bridge. The broad-bearing jumbo pads plus balanced suspension of the frame distribute the light weight of the goggle evenly across the nose. The pads also seal the entire eye area to prevent entrance of foreign particles.



DUPLEX SURFACE BROACHING MACHINE over 15 ft. high weighs more than 24 tons. Built by American Broach and Machine Co., Ann Arbor, Mich., it was built to broach large diesel bearing supports. The part broached weighs over 150 lb. About ½ in. of stock is removed on approximately 110 sq.in. of surface. Automatic cycle of the left-hand table and right-hand broach arbor is an outstanding feature of the design. Both index six times in generating one complete broaching cycle. The 72-in. stroke machine has a continuous cycle during the six passes and has increased production 20 times over the previous method. A chip conveyor is provided to handle the large volume of chips that is accumulated



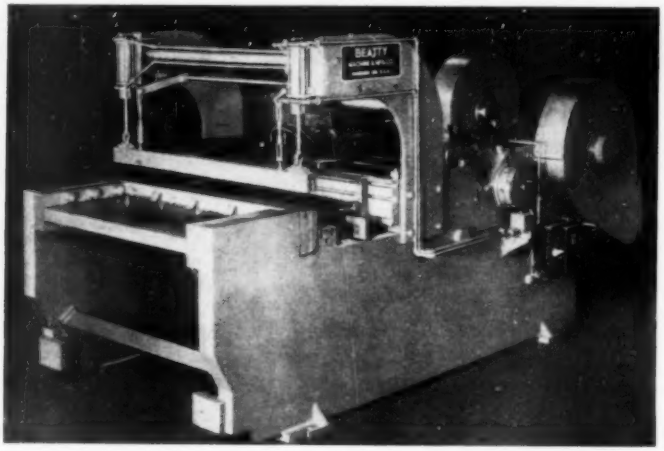
M & N Hydraulic Hobbing Press Exerts 1000-Ton Platen Pressure

The M & N Machine Tool Works, Inc., 152 Orono St., Clifton, N.J., offers a hydraulic hobbing press featuring a platen pressure capacity of 1000-ton. The ram has a stroke of 4½ in., and a diameter of 21 in. Each of the four columns is 5¾ in. in diameter. The opening is 14x17x30 in. The press requires a floor space of 48x48 in. and is operated by a 3-hp. motor.

Double-Acting Dial-Feed Tables Introduced by A. K. Allen Co.

The Model 11 DA and 11 DB double-acting dial-feed tables are announced by the A. K. Allen Co., 495 Wythe Ave., Brooklyn 11, N.Y. Tables are identical to the single-acting table, except that they feature a 2¼-in. dia. double-acting cylinder. They are said to have more than three times the power of the single-acting model.

The Model 725 DA and 725 DB table is identical to the single-acting table, except that it has a 1¼-in. dia. double-acting cylinder for actuating the pawl lever. Power is about 60% greater and the double-acting cylinder gives indexing speed control.



Beatty Horizontal Multiple Punch Adjusts Tools to Varying Centers

A horizontal multiple punch with provision for punch tools to be mounted on varying centers across the ram face is built by Beatty Machine & Mfg. Co., Hammond, Ind. It is designed for multiple punching the flanges of long, wide sheets.

An air clamp holds the material down during the punching operation. Stripping is accomplished by air cylinders which travel with the ram. Clutches are of the jaw type with V-belt motor drive to the flywheel.

The punch is available in capacities from 50 to 300 tons. The 2-ton machine illustrated has a 6 in. stroke and will make 28 strokes per min. It is 63 in. between housing with a 5 in. throat depth.

SUN OIL COMPANY

announces

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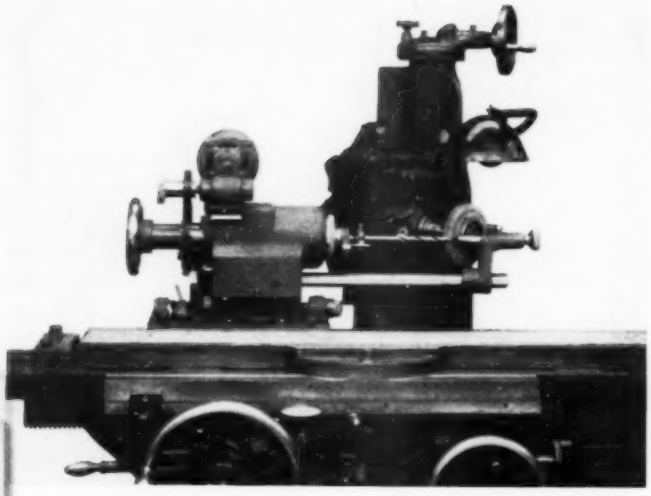


Glenbard Fixture Grinds Tools With Spiral and Radial Relief

A fixture for grinding both spiral and radial relief is announced by Glenbard Tool Manufacturers, Inc., 216 N. Clinton St., Chicago, Ill. Known as the Spi-Rad, it is said to be the first fixture capable of "on center" spiral and radial relieving.

The fixture can be fitted to any universal tool grinding machine. On the base is mounted the main body, to which is attached the backplate mechanism. This contains the cam assembly that gives the fixture helical or spiral motion. On the stud on which the cam is mounted, is also mounted one of the change gears which give the required indexing.

On the back side of the main body is a sine bar adjustable for the required amount of radial or diametral relief. On the left side of the base a sine bar is mounted which is adjustable for the required helical or spiral relief.

Form tools ground with this fixture have exact dimensional contour which remains constant throughout the life of the tool in contrast with tools ground with angular relief which must be discarded after two or three sharpenings.

After the form has been ground, the actuating mechanism can be engaged and the tool relieved immediately without removing the fixture from the machine. The number of flutes desired, from one to six, is controlled by a simple gear change.

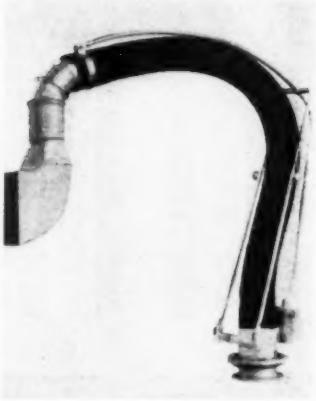
The Spi-Rad has been tested at plants of the Appleton Electric Co., and Bendix Aviation Corp. Glenbard will sell the fixture for $975 or supply tools ground to specifications with spiral and radial relief.

Covel Hydraulic Surface Grinder Is Equipped with 12-in. Wheel

A hydraulic surface grinder with 8x24-in. capacity is announced by Covel Mfg. Co., Benton Harbor, Mich. The No. 35 grinder is designed to provide a larger capacity Covel grinder at a moderate price.

Suitable for toolroom or production work, it has spindle speeds of 1750, 2200 and 2600 rpm. Table speeds up to 90 fpm. are provided. The 12-in. wheel is larger than that provided in previous models and is powered by a 2-hp. motor.

Features of the smaller Covel grinder are included. The interchangeable, sealed - for - life, quill-type spindle has pre-loaded bearings. The hydraulic system is said to provide smooth table reversal and gives automatic pressure lubrication to bearings and ways. Hard-chrome table ways are available.

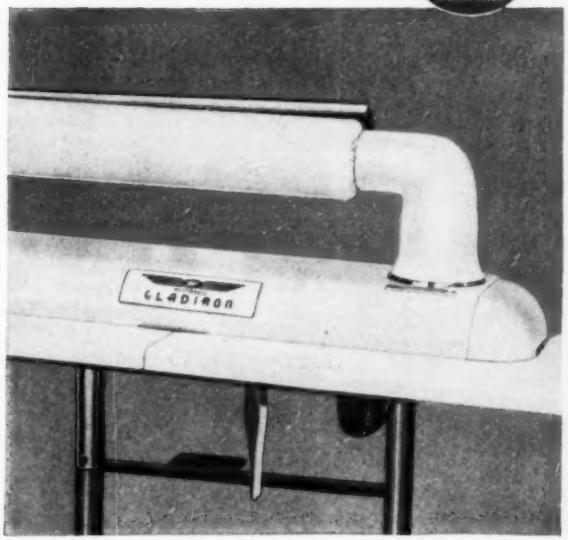


Torit Suction-Tube Assembly Is Offered in 3x4-In. Sizes

A suction-tube assembly for connecting self-contained dust collectors to wheels on surface grinders, tools and cutter grinders, and other machines that cannot be properly hooded, is offered by Torit Mfg. Co., 303 Walnut St., St. Paul 2, Minn. Made in 3x4-in. sizes to fit standard inlet holes, assemblies have duck-covered hose for flexibility. The new suction-tube assemblies can be fitted with either vertical- or angular-type nozzles.

REPEATER BRUSH is now incorporated into the handle of the Bernard Multi-Pic Weld Cleaning Tool. Offered by the Bernard Welding Equipment Co., 741-743 E. 71st Street, Chicago 19, Ill., the brush is designed to reach into deep corners and crevices. To adjust the brush as wear progresses, a flat-head screw which holds the shank of the brush is removed, another usable portion of the brush drawn out of the adjustment, and the screw again inserted. Five adjustments are provided

ANOTHER 3M COMPANY SERVICE STORY



The flawless finish on this Thor Gladiron* is obtained with belt grinding operations suggested by 3M Methods Engineers. This fast, efficient finishing method helps maintain a low retail price.

Polishing Gladiron* gray iron drive housings on one of several backstand belt grinders now in use by Thor cuts finishing time in half. This *one operation alone* saves $6000 a year in finishing costs.

How belt grinding saved the makers of Thor Gladirons* $20,000 a year

Since a 3M Methods Engineer surveyed the grinding and finishing operations at the Thor Corporation . . . many former metal finishing methods have been replaced with 3M Abrasive Belts. Cost analyses show belt grinding is saving Thor $20,000 annually, over previous methods of metal removal and polishing.

The 3M Method of Grinding and Finishing metals, wood, glass or plastics . . . is a production line technique that replaces conventional methods of stock removal and polishing. Our Methods Engineers are trained in the mechanical application of coated abrasives, and are familiar with all metal finishing systems.

*REG. U. S. PAT. OFF.

Made in U.S.A. by **MINNESOTA MINING & MFG. CO.**, *St. Paul 6, Minn.*

The attached coupon is your invitation for a 3M Methods Engineer to analyze your grinding or finishing operations. No obligation, of course.

Please send me a copy of your "Step Up Production" booklet.
Please send a 3M Methods Engineer to call on us. AM-349

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3M ABRASIVE BELTS

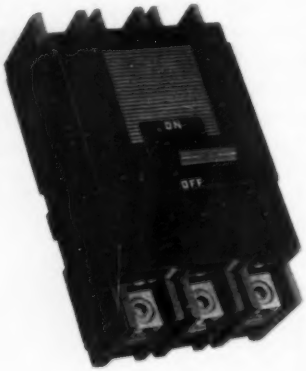
General Export: DUREX ABRASIVES CORP., *New Rochelle, N. Y.* • *In Canada:* CANADIAN DUREX ABRASIVES LTD., *Brantford, Ontario*

Hammond Carbide-Tool Grinder Operates Either Wet or Dry

The model WD-10 carbide-tool grinder built by Hammond Machinery Builders, Inc., Kalamazoo, Mich., can be used either wet or dry. It is supplied with a coolant system for wet operation and a baffle plate and exhaust system for dry operation.

The 10x19-in. tables are equipped with a removable steel wear plate and table slot. Tables are adjustable from 15° above to 30° below horizontal.

A safety-cup disk fills the open cup of the wheel and prevents injuries or the dropping of tools into wheel cups. In addition to the basic model with two cup wheels, model WD-10S has one cup and one straight wheel. Both models are also available for dry grinding only.



Square D Circuit Interrupters Offered in Cast-Iron Inclosures

Circuit interrupters available in cast-iron inclosures are offered by the Square D Co., 6060 Rivard St., Detroit 11, Mich. Inclosures include weather-proof, dust-tight, dust-resisting and explosion-resisting types. They enable interrupters to be located in dusty, gritty, explosive or other hazardous atmospheres, outdoors or indoors, and in locations exposed to splashing or dripping water.

The interrupters do not have thermal and magnetic trip features. They are designed for use in locations where space is limited and a local disconnect is necessary.

Lepel High-Frequency Heating Unit For Hardening, Soldering, Brazing

A vaccum-tube high-frequency heating unit for non-ferrous as well as ferrous materials at any desired temperature is offered by Lepel High Frequency Laboratories, Inc., 39 W. 60th St., New York, N. Y. The machine can be used for hardening, soldering, brazing, or melting. It consumes 1 gpm. of water when idling, less than 5 gpm. at full load.

Small Pneumatic Die Cushions Feature Regulator and Gage

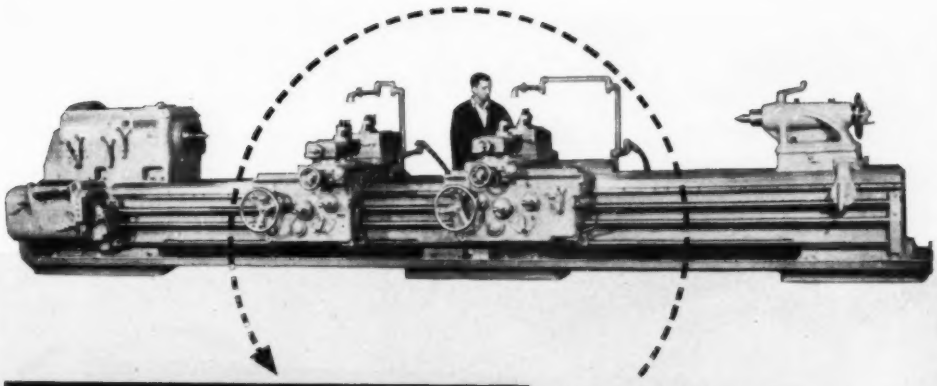
A small-size pneumatic die cushion is offered by Dayton-Rogers Mfg. Co., 2824 13th Ave. South, Minneapolis 7, Minn. The 3-in. size Model D-3, is being used on small electric-type presses. The hardened and ground pin-pressure pad is custom made to fit the customer's press bed opening, and the unit itself is provided with a combination regulator and gage.

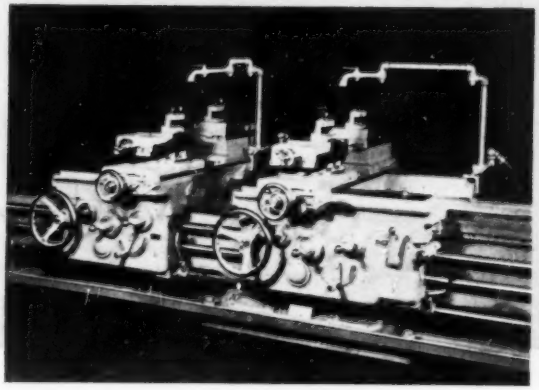
The reducing air regulator is to provide a constant air pressure at all times. It has an over-size cylinder guide rod, together with an adjustable handwheel to stop the pin pressure pad at a predetermined position, compensating for bolster plate thickness variation for the sharpening or grinding of dies used in connection with the die-cushion.

BANDSAW CONVERTER, the Plani-Drive, which converts wood-cutting bandsaws to cut such metals as aluminum, copper, brass, iron and steel, is offered by The Erwood Co., 214 Woodstock St., Crystal Lake, Ill. The Plani-Drive is a two-speed gear-type transmission mounted on a stamped steel V-belt with pulley and speed change lever to change from wood to metal cutting speeds

Standard Line of Solid-Carbide Cylinders Offered by Carboloy

A standardized line of solid-carbide cylinders, both ground and unground, at reduced prices in quantities of 50 and over, is offered by Carboloy Co., Inc., Detroit, Mich. The line is comprised of 115 sizes. Cylinders range in diameter from 3/32 to ½ in. in lengths ranging from 3/16 to 1½ in.





2 Carriages... 4 Cuts... Many Uses

● To that headline we might add. "Heavy cuts in half the time—with better finish", because that's the characteristic performance of the Monarch Heavy Duty Lathes with Dual Carriages.

The use of Dual Carriages is particularly advantageous on long shaft and roll work. By dividing the over-all cut between the tools on the two carriages, both of which operate simultaneously, output is doubled.

Versatility may be increased so that the range includes both long and short work. As on the 32" x 204" Model NN lathe, illustrated above, the carriages are offset to the left and right to permit simultaneous cuts on short shafts without carriage wing interference.

To further reduce turning costs, the compound rests are furnished with rear rests. Independent and simultaneous feeds are provided, thus enabling the user to take four cuts simultaneously. Total amount of stock removal is divided between the front and rear cutting tools with the rear cut balancing and slightly following the front cut. Result—better finish in half the time.

These optional design pluses of Monarch Heavy Duty Lathes are in addition, of course, to the famous Monarch construction features—flame hardened and ground bedways, extra rigid bed design, helical geared headstock and the liberal use of anti-friction bearings and hardened parts throughout. All these add up to accurate, dependable, *economical* metal turning.

May we show you how modern Monarch Turning Machines can increase your production—and your profits?

THE MONARCH MACHINE TOOL CO., Sidney, Ohio

ACCURACY · ECONOMY · LONG LIFE
Monarch
TURNING MACHINES

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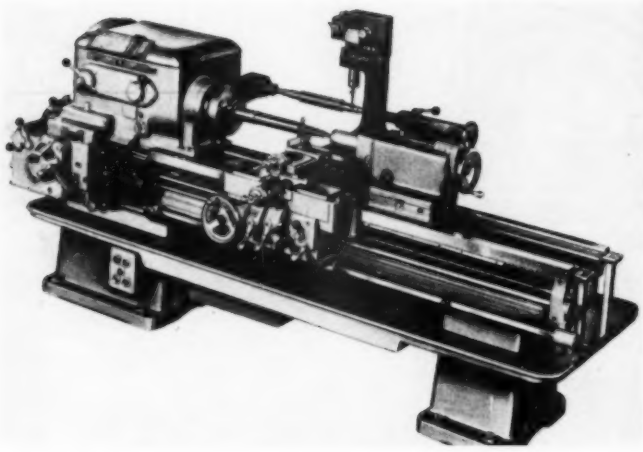


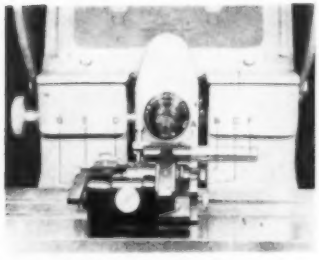
Lodge & Shipley Copymatic Lathe Serves as Automatic or Standard

A tracer-controlled, dual-purpose lathe has been developed by The Lodge & Shipley Co., Cincinnati 25, Ohio. Known as the Copymatic, it incorporates a hydraulic tracer control in the standard model X 15- and 20-in. medium- and heavy-duty, and 25-in. medium-duty lathes.

Change from automatic to standard operation is accomplished by changing two valves and a switch. When duplicating, the lathe will operate from round or flat templets, doing any turning or boring jobs within the range of the lathe. In many cases the templet can be eliminated by machining the first part by standard operations, then using it as a templet for automatic production of the remaining parts.

Swing capacity of the lathe is maintained because standard compound rest and crossfeed screw assemblies are retained and direct connected to the hydraulic piston operating in the cylinder mounted on the rear of the carriage. There is nothing to take off or put on when changing from one type of operation to the other.

Tracer equipment includes a hydraulic pump and motor, Purolator, air filter, tracer head and one stylus, valves and switches, hydraulic clutch and brake for controlling longitudinal feed, hydraulic piston and cylinder for crossfeed control, and supports for templets.



Jones & Lamson Universal Stage Checks All Elements of Thread

A universal screw stage for checking screw threads on optical comparators is announced by Jones & Lamson Machine Co., Springfield, Vt. The device is claimed to provide the only method which simultaneously compares all the elements of the thread with a master gage.

The operator can check at a glance lead (for the whole length of engagement of the screw), pitch diameter and thread angle, crest, root, and taper. The enlarged shadow reveals wear of tool, chasers, rolling dies, or grinding wheel.

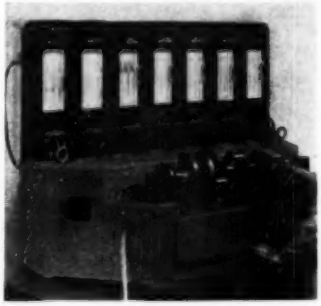
This universal stage will measure a wide range of diameters and pitches, as well as right- or left-hand threads. It will accommodate screws from 3/16- to 1-in. dia. and pitches from 6 to 44.

A pair of rolls, corresponding to the pitch of the thread to be inspected, is mounted on the roll shaft. The fixed roll is spaced longitudinally from the center of the lens a distance equal to the length of engagement of the screw to be inspected. A master gage is staged on the rolls. It is supported by adjustable backstop *A* and spring-operated clamp *C*. The enlarged shadow is then made to coincide with the correct tolerance outline on the chart. The master gage is then replaced by the production screw to be inspected.

Willson Plastic Eye Protection Features One-Piece Plastic Lens

A plastic eye protection for semi-hazardous jobs is offered by the Willson Products, Inc., Reading, Pa., called MonoGoggles. The eye protections are made of a one-piece plastic lens. Low heat transmission of the lens retards fogging.

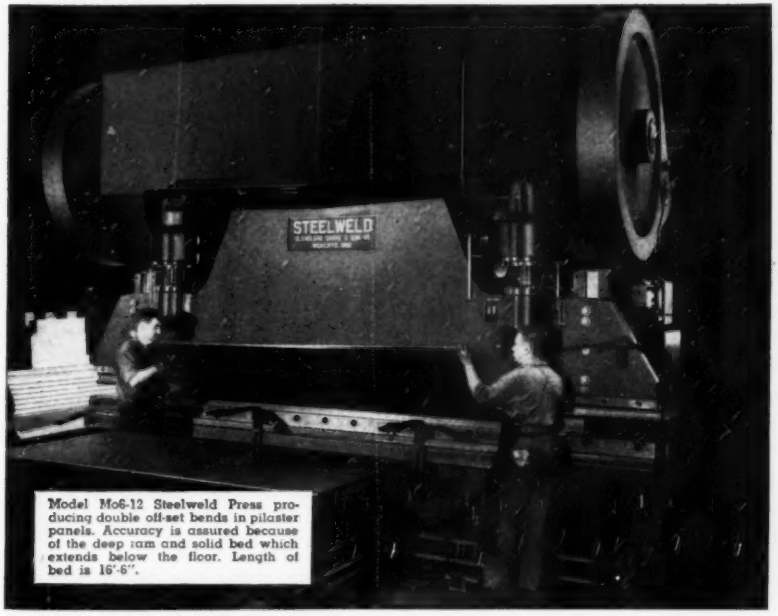
Both flat and curved lenses are available, so that those who wear prescription glasses may select the style most comfortable. Lenses come in either clear or green acetate and are replaceable.



CRANKSHAFT GAGE built by The Sheffield Corp., Dayton 1, Ohio, has 20 Precisionaire tubes. Each main bearing is checked at three points. Two jets check seal diameter and width of rear main bearing. A manually operated Airsnap with three jets checks the diameter at each end of the pin bearing and the breakdown of the radius at the cheeks

Special Press features

SPEED PRODUCTION



Model Mo6-12 Steelweld Press producing double off-set bends in pilaster panels. Accuracy is assured because of the deep ram and solid bed which extends below the floor. Length of bed is 16'-6".

It takes power to make long sharp bends. It takes size and design to assure accuracy. The Mills Company, Cleveland, Ohio, well-known manufacturers of fine metal partitions achieve both with their big 500 ton capacity Steelweld Press.

But more! They also obtain speed and safety. Their machine is provided with several features that are extremely advantageous:

1. Air-electric control for high production.
2. Electric foot switches for easy fatigueless operation.
3. Ram-positioning selector for stopping ram automatically at pre-selected points.
4. Two speeds, 7 or 21 strokes per minute for best operating speed.
5. Reversing flywheel for quick stopping or reversing of ram at any point.
6. Safety dual control permitting operation only when both operators are ready.

The Mills Company are proud of their modern Steelweld Press. It is the largest of several press brakes in their plant. It is in continuous operation, two shifts a day.

GET THIS BOOK!

CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

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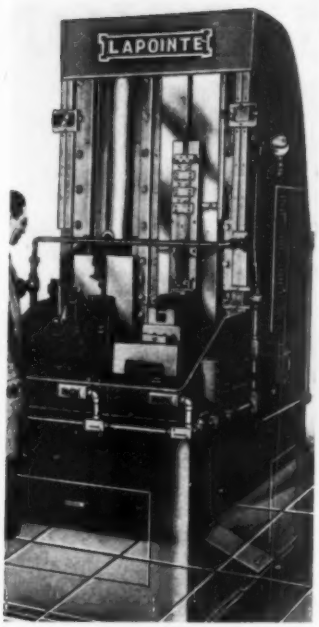


Lapointe Vertical Surface Broach Has Low-Pressure Hydraulic System

A heavy-duty double tip-down fixture and a low-pressure hydraulic system are among the improvements incorporated in the new standard double-ram vertical surface-broaching machine built by Lapointe Machine Tool Co., Hudson, Mass.

The double tip-down fixture permits the operator to load the work on one table while the other table is in broaching position. Special workholders can be adapted to either fixture.

Speed control is said to be simplified and conveniently located. A separate automatic force-feed system constantly lubricates the ways and other moving parts. A safety switch stops the machine if the oil level in the lubricating reservoir drops below the safety point.

The low-pressure hydraulic system is said to provide smoother operation and eliminate vibration and high-pressure shock. Increase in the size of the oil reservoir and changes in control circuit design tend to keep oil at normal operating temperature.

Overload capacity has been increased to 35% above rated tonnage. Operating speeds of fixtures and rams have been increased. Limit controls are designed to simplify stroke adjustments.

To simplify preventive maintenance, control valves are gasket-mounted in a compartment for inspection and removal without disturbing the piping. The electrical-control panel is in another compartment for inspection from the outside.

Full-length mounting pads secure the main cylinder to the welded-steel frame. All parts are normalized to eliminate stresses and strains in the fabrication and weldments. The design is said to give greater rigidity for cutting the tougher steels now encountered.

Type BL Hole-Punching Units Feature New Punch Retainers

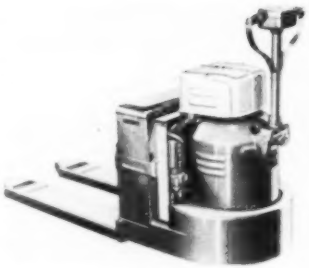
A line of Wales Type BL hole punching units with new punch retainers is offered by the Wales-Strippit Corp., North Tonawanda, N.Y. The units with the new punch retainers are independent and self-contained. The punches, stripping guides, stripping springs and guide buttons are not attached to the press ram, but are component parts of the self-contained hole-punching unit.

The punches and dies are automatically aligned by the holders. These hole-punching units can be used with Wales notching units to permit punching and notching in the same operation. The units are available to punch holes up to 2 in. in diameter and to ⅛-in. thick mild steel.

Beverly Portable Slitting Shear Handles 10-Gage Stainless Steel

A portable slitting shear with a capacity of ⅛ in. in mild steel and 10 gage in stainless is offered by the Beverly Shear Mfg. Co., Chicago, Ill. An adjustable shoe provides additional support at the toe of the upper blade holder. Shear blades are interchangeable and adjustable. The shear is furnished with tempered and drawn tool steel blades or high-carbon high-chrome blades for working in stainless steel.

Towmotor Enters Electric Field with Model W Hand Pallet Truck



A battery-powered hand pallet truck marks the entry of Towmotor Corp., Cleveland 10, Ohio, into the electric hand-truck field. Previously the firm has manufactured gasoline-powered fork lift trucks and tractors.

The truck is said to be easily maneuvered in close quarters and to have a high safety factor under maximum loads. The safety handle has control buttons for either left- or right-hand operation. The 3-point suspension system to provide smooth travel over uneven surfaces includes differential-action trailer wheels to eliminate wheel scuffing and insure easy turning.

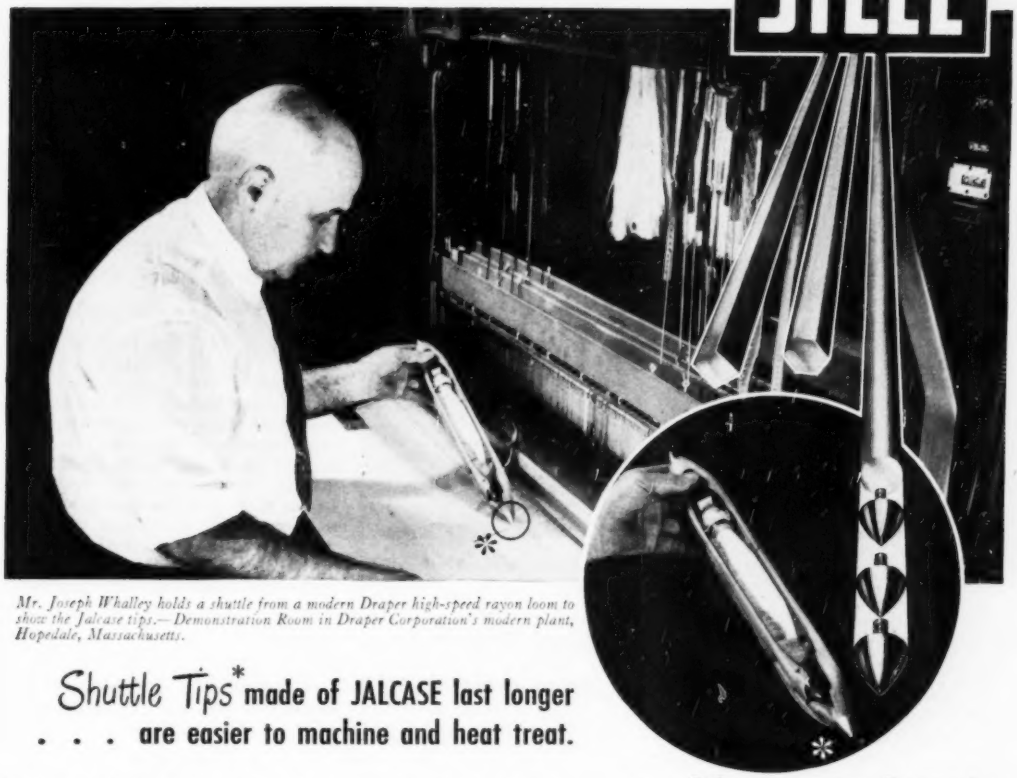
An automatic power cutoff in the model W cuts off the power supply when the control handle is released and applies a positive quick-acting brake to the driveshaft, immediately stopping the truck.

DRAPER CORPORATION world's largest loom manufacturer

LOWERS PRODUCTION COSTS WITH

J & L COLD-FINISHED JALCASE STEEL

J&L STEEL



Mr. Joseph Whalley holds a shuttle from a modern Draper high-speed rayon loom to show the Jalcase tips.— Demonstration Room in Draper Corporation's modern plant, Hopedale, Massachusetts.

Shuttle Tips* made of JALCASE last longer . . . are easier to machine and heat treat.

Most likely the fabric in your broadcloth or oxford shirt was woven on a Draper loom, because Draper Corporation is the world's largest manufacturer of cotton and rayon looms. —And on many of the shuttles in these famous looms, the tips are made from J&L COLD-FINISHED JALCASE, the *original* open-hearth free-machining steel.

These tips must withstand *millions* of blows from the "pickers" that send the shuttle flying back and forth across the loom as many as *225 times a minute*. The steel must have uniform heat-treating characteristics to produce tips with *hard* points, *soft* shoulders and *tough* stems. Besides, Draper wants a steel that machines freely to a smooth finish at high speeds, and a steel that conserves tool life. That's why Draper uses J&L COLD-FINISHED JALCASE. It reduces production costs!

Here is a steel that is practically "tailor-made" to your requirements. From the ten grades of JALCASE, you can select just the right properties that suit *your* manufacturing conditions best. The result is: Higher production . . . Longer tool life . . . A better product. No wonder that J&L COLD-FINISHED JALCASE has been the *leading free-machining steel* for more than 25 years!

We have just published a new booklet describing the ten grades of J&L COLD-FINISHED JALCASE Steel. Let us send you a copy. It's free. The coupon is for your convenience.

Jones & Laughlin Steel Corporation
402 Jones & Laughlin Building
Pittsburgh 19, Pennsylvania

Please send me your new booklet on J&L COLD-FINISHED JALCASE— the *original*, open-hearth, free-machining steel.

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From its own raw materials, J&L *manufactures a full line of carbon steel products, as well as certain products in* OTISCOLOY *and* JALLOY *(hi-tensile steels).*

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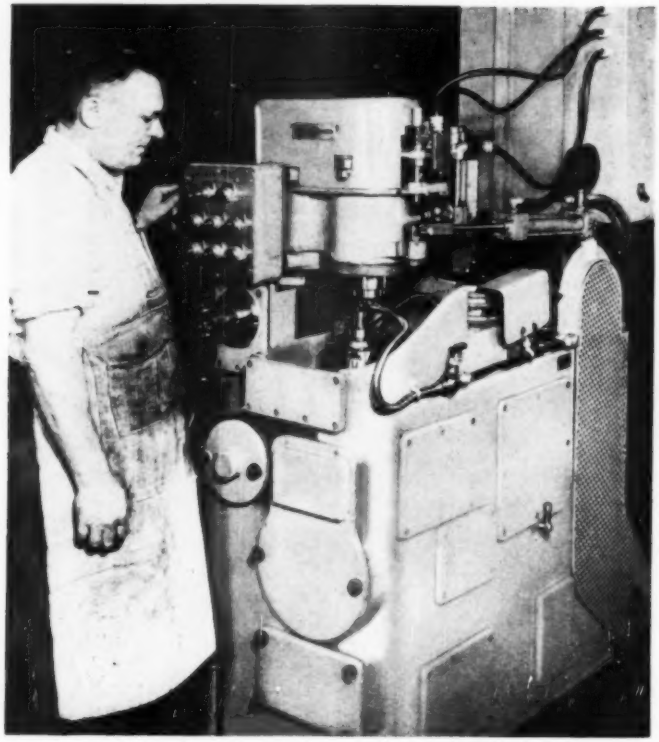


Automatic cycles for both internal and external work mill contours on work to 5-in. dia. from master cam

Sundstrand Contour Milling Machines Copy Master Cam in Automatic Cycle

A cam-controlled contour milling machine built by Sundstrand Machine Tool Co., Rockford, Ill., combines in one machine a vertical spindle milling head, a cam follower, a cam-carrying table, and a rotary work table. It is designed for milling irregular contours from master cams.

The machine provides a wide range of automatic cycles for both internal and external milling of practically any contour on work up to 5-in. dia. The compact design permits line installation for convenient operation of a group of machines by one operator. All the operator has to do is unload, reload, and start the automatic cycle of the machine.

Master cams can be cut on the machine from sample parts. The ratio between the cam-roller arm and the cutter arm is 2 to 1 which reduces any cam area one half on the finished part. The master cam can, in most cases, be made considerably larger than the work to eliminate excessive cam rises.

Cutter spindle is driven by V-belt from a ¾-hp. variable-speed unit which provides infinite speed changes from 425 to 4150 rpm. Vertical adjustment of the cutter head is from 3¼ to 8 in. from top of rotary table to spindle nose. Vertical feed is 1¼ in.

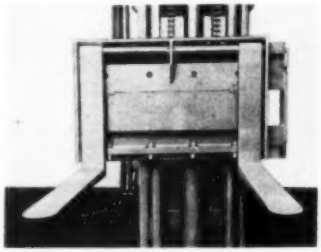
The rotary table, 6-in. dia., and the cam-carrying spindle are worm driven from the same motor at 1 to 1 ratio. Table feeds are variable from 0.2 to 5 rpm. with a rapid rate of 40 rpm. Dogs on a cycle disk control the degree of table rotation in rapid approach, feed, and return in either direction up to 1 1/3 revolutions.

There are 24 cycle combinations which can be set up to handle many different kinds of work.

Sheffield Spline-Burring Machine For Involute or Straight Spline

A spline-burring machine is offered by the Sheffield Corporation, Dayton 1, Ohio. It is a flytool machine for burring a spline where the adjacent shaft diameter approaches the root diameter of the spline. It can be used for spline burring of either involute or straight spline, and can handle more than one size provided the parts lend themselves to the general machine specifications.

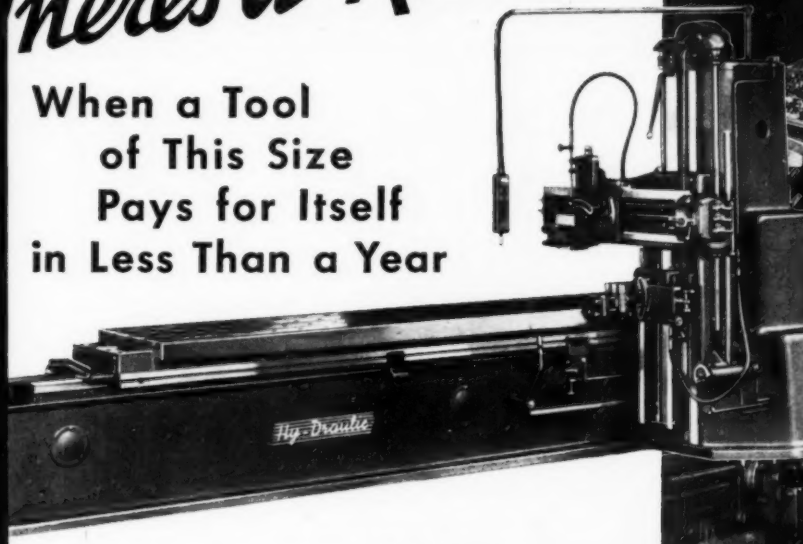
The part is placed in a receiver and the hand- or air-operated clamping device forces the part into a rotating spline collar and forward against a positive stop. Part and cutter are timed together. The flytool passing through the spline tooth, chamfers a 30° to 40° angle.



SIDE-SHIFTING ATTACHMENT for the carriage of the company's power fork trucks, is offered by Lewis-Shepard Products, Inc., 281 Walnut St., Watertown 72, Mass. Shifting of fork is controlled by a hydraulically operated "deadman" type lever, located on the operator's cab. The forks can be shifted and held by as much as 4 in. to the right or left of center position. Total travel is 8 in.

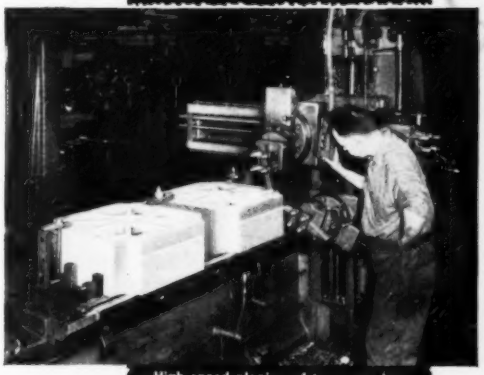
There's A Reason

When a Tool of This Size Pays for Itself in Less Than a Year



Planing a Spring Hanger Die out of HARDTEM B steel. Tolerance ±.003", good commercial finish. Transue & Williams Steel Forging Corporation.

Machining copper Ultra-Speed Resistance Welder Unit for The Federal Machine and Welder Company to a mirror finish. Tolerance ±0.000".



High speed planing of two grey iron spacer blocks for The Hoover Company Tolerance ±.0025".

ROCKFORD *Hy-Draulic* SHAPER-PLANER

Rockford *Hy-Draulic* machine tools, such as the Shaper-Planer illustrated above, have in many cases paid for themselves in less than a year in places where they have replaced obsolete or worn equipment . . . and have invariably increased production and lowered costs when replacing mechanically actuated tools.

The reason? Superior construction of Rockford machines and unmatched efficiency of *Hy-Draulic* powered table drives and tool feeds . . . plus easy work set-up, easy machine adjustment, uniform speed for the full cutting stroke, rapid reversal and quick return. The result is precision work at high production speed.

Rockford Hy-Draulic Shaper-Planers are built in five standard sizes, with table stroke lengths from 42" to 144". Second cross rail head . . . and side head available as extra equipment.

You are invited to compare Rockford performance with that of your present equipment. We will be happy to make a machine time estimate on any part. Send your blueprints to our engineering department.

ROCKFORD MACHINE TOOL CO.
ROCKFORD ILLINOIS

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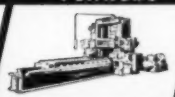
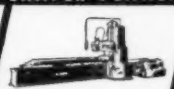
SHAPERS

PLANERS



SLOTTERS

SHAPER-PLANERS



Parts and Materials

SQUIRREL-CAGE INDUCTION MOTORS are offered by Electric Machinery Mfg. Co., Minneapolis 13, Minn. Design "X" offers extra-low kva, across-the-line squirrel-cage induction motors. Motors are for direct connection to air compressors operating at 720, 600 and 514 rpm., permitting across-the-line starting with a starting kva. 20% lower than the present NEMA Design B, low kva. normal torque squirrel-cage induction motor. It is available in flange-mounted overhung type and two-bearing type. Ratings are 60, 75, 100, 125, 150, 200 and 250 hp.

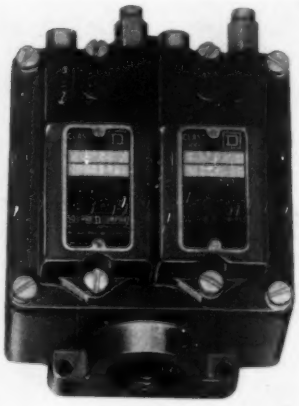
Dry-Chemical Fire Extinguisher Recommended for Electrical Fires

American-LaFrance-Foamite Corp., Elmira, N. Y., offers the Alfco dry-chemical fire extinguisher. The dry chemical is nontoxic, noncorrosive, a non-conductor of electricity and will not freeze. It is recommended for flammable liquid and electrical fires. The extinguisher is a hand portable unit identified as No. 30. Features include longer range, longer duration of discharge, and lighter weight.

Flex-A-Matic Clutch by W.S.K. For V-Belt Drives is Automatic

The variable-pitch diameter Flex-A-Matic clutch made by the W.S.K. Inc., 405 Donovan Bldg., Detroit 1, Mich., is an automatic clutch for V-belt drive. It is suited for gasoline or electric power sources. The clutch employs a built-in transmission similar to that found in modern automatic vehicle transmission.

In operation the clutch is disengaged with the belt running free at starting or idling speed. As the rpm. is increased, the clutch gradually takes up the load carrying it to first and second, until efficient operating speeds are reached with clutch fully engaged.



DUPLEX LIMIT SWITCHES are offered by Square D Co., 4041 N. Richards St., Milwaukee 12, Wis. The design permits the use of one switching unit when two limit switches are needed. A single duplex switch can also be used to replace two separate limit switches on present machines or equipment. Switches are rated at 700 volts ac. or dc., and will operate at temperatures to 200 F.

High-Temperature Bolts, Nuts Resist Oxidizing to 2100 F.

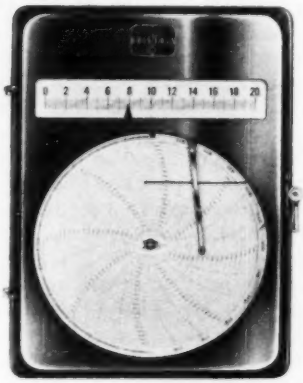
Bolts, nuts and other types of fasteners offering good properties for severe services at elevated temperature in gas turbines and other highly stressed applications are available in several of the ultra-high temperature service alloys.

The line of fasteners is manufactured by the California Precision Castings, Inc., Glendale, Calif., and marketed through the Franklin C. Wolfe Co., 407 Commercial Center St., Beverly Hills, Calif. Products are resistant to ozidizing and reducing atmosphere up to 2100 F. They are available for SAE thread sizes in internal wrenching socket head bolts, with or without safety wire holes.

American Optical Heavy-Duty Glove For Handling of Small Castings

A heavy-duty glove for handling small castings, rough stock, grinding and similar work is offered by the American Optical Co., Southbridge, Mass. The glove is made of treated chrome tanned cowhide and has a canvas back with an elastic strap to overcome hand fatigue and provide a cooler feeling and snug fit.

All necessary seams are steel sewed. The seam along the forefinger has been eliminated for longer glove life and added comfort at this vulnerable point.



TIME-IN-PROCESS RECORDER is offered by the Bristol Co., Waterbury, 91, Conn. The instrument gives a reading on a uniform scale and chart of rate of conveyor movement, directly in terms of the total time consumed by work in traveling through a process. Readings are given directly with no calculations required. Recorders can be used on such equipment as continuous furnaces for metal annealing, tempering and hardening, continuous drying and baking ovens

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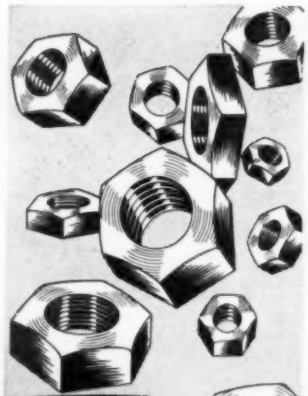
per tap

TO
22,000
clean class 3 threaded
holes per tap



HERE'S HOW
HY-PRO DID IT...

PART: 18-8 stainless steel hex nut with *punched hole*

PROBLEM: Tapping with a 10-24 tap, a leading nut manufacturer experienced difficulty holding size and was troubled with excessive tap breakage.

Then They Called in the HY-PRO Sales Engineer

HY-PRO SOLUTION: His recommendation was a standard Hy-Pro 10-24 machine screw tap with one of the exclusive Hy-Pro surface treatments for wear and lubrication. Speed and cutting oil were adopted from extensive tables in Hy-Pro catalog. Production with Hy-Pro taps now averages 22,000 burr-free *Class 3* threaded holes at 62 nuts per minute.

Above is a typical example of how the Hy-Pro Sales Engineer can help increase threaded-hole production. His expert engineering counsel backed by the most up-to-date tap production methods combine to solve tapping problems rapidly and profitably.

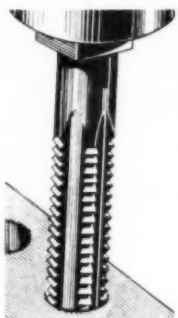
All Hy-Pro Taps are ground from tough uniform quality high-speed steel and given one of the Hy-Pro exclusive surface treatments.

Each tap is completely inspected by the latest electronic quality control equipment, your assurance that there will be no dimensional variance in Hy-Pro Taps of a stated size.

These precision manufacturing methods plus the ability of the Hy-Pro Sales Engineer to prescribe the correct tap for your particular job means *sustained accuracy* on your production line resulting in higher productivity from your tapping machines.

℞ Let Hy-Pro solve your tapping problem—call a Hy-Pro Sales Engineer today.

Order from your distributor.



HY-PRO TAPS

HY-PRO TOOL CO.
NEW BEDFORD, MASSACHUSETTS
A SUBSIDIARY OF CONTINENTAL SCREW COMPANY

ROUND TABLE Discussion

TALK OR SWEAT FIRST?

I think a foreman's obligation to both his employer and to the new man goes far beyond that of just giving the new man a job and ignoring everything else. While the personnel office can check up in reference to character and ability, they cannot determine his efficiency or whether he will fit in with the organization. It is the foreman's job to accomplish this by doing his utmost to get the man feeling comfortable and properly started. Included in the things that a new man should be told are the location of the works' cafeteria or other eating places, the storeroom, locker rooms, rest rooms and the like. He should also be introduced to his co-workers—might even have one of his co-workers work along with him for a day or two. All of these will make him feel satisfied and contented, and will speed his fitting into the organization.

During all the period of his adjustment, the worker will appreciate an occasional opportunity to chat with the foreman, both to find out the attitude of the company and to become better acquainted with his boss. This also gives the foreman an excellent opportunity to find out how the worker thinks on many subjects.

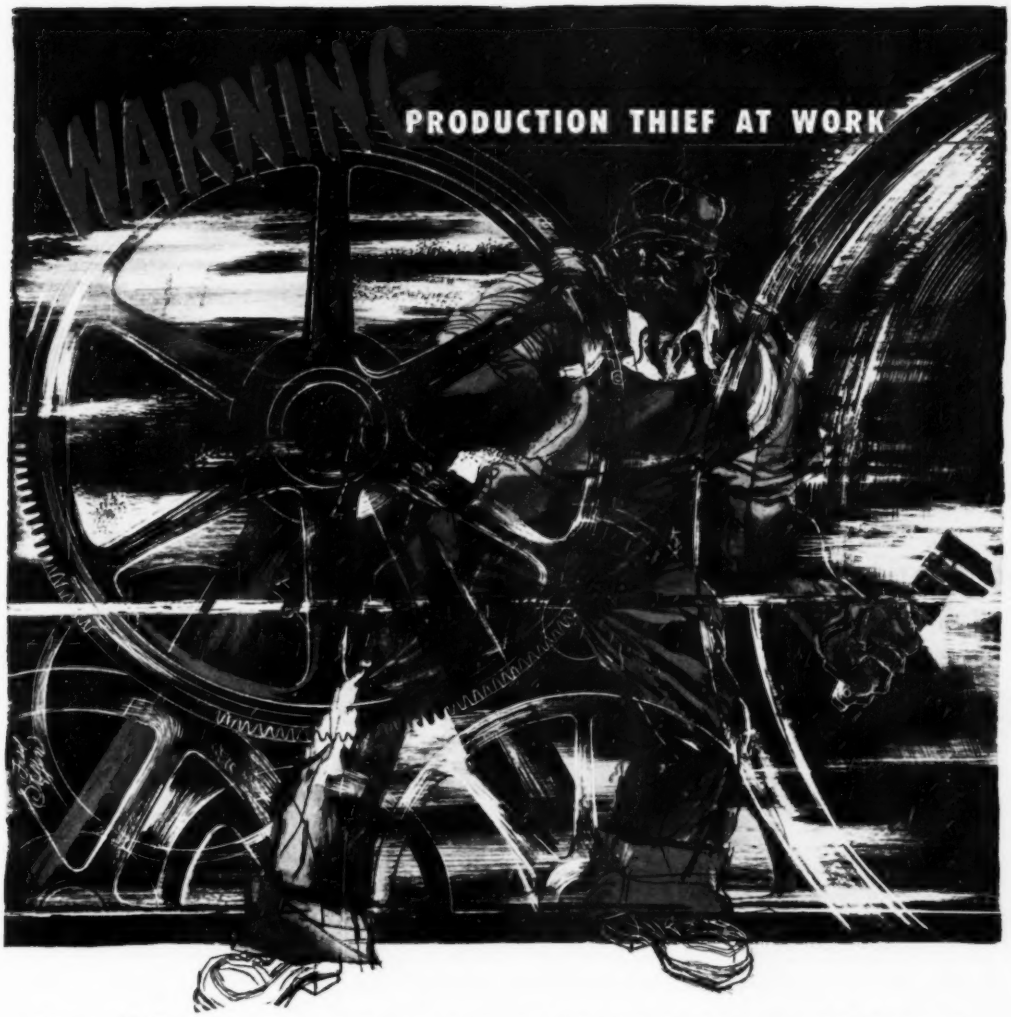
Today many men with undesirable political ideas or affiliations are highly competent workmen; in a few months they can stir up serious trouble, particularly where the plant is organized by Unions. It is therefore part of the foreman's responsibility, not only to the company, but to the other employees, to be sure that the new man is an honest American citizen who appreciates the tremendous advantage this country affords its citizens in our way of life.

Arthur Silvester
Niantic, Conn.

•

THAT'S MY BABY

There's an old saying—"It's a wise father who knows his own child"—and it's a wise foreman who recognizes and insists that the granting of time off to his men is his "baby." When the Big Boss issues an executive order that no man can have



He's a thief of the "sneak" variety—pilfering, robbing, stealing valuable production from machines in thousands of plants. The cost of his thievery is staggering—but he *can* be stopped!

You may not even suspect that he's at work in your plant. You may have to *look* close to find him. But there's a big reward when you do.

For example . . . here are some places to look.

Are you still using the old-fashioned "hand and paddle" method of filling grease guns—wasting time, wasting grease, risking grime and dirt? *There's a thief!*

You can save 3¾ man hours for every 100 lbs. of grease.

Are you lubricating machines the hand and muscle way? *Watch for losses here!*

You can save up to 23.9 man hours in applying each 100 lbs. of grease.

What about "down-time"—production interruptions for lubrication, or for part replacements due to faulty lubrication? *More thievery!*

You can lubricate hundreds of bearings from one central point, with the right amount of lubricant, while machines continue to produce.

Now are you suspicious that a production thief is working in your plant?

His disguise is "old-time, hit-or-miss, costly lubrication methods" that add to the costs of production.

There's one proven way to stop this loss.

An Alemite representative can tell you in 10 minutes how Alemite Methods will simplify and better organize your lubrication procedures. He can show you how mechanized lubrication from barrel-to-bearing will increase your production and profits.

Telephone your Alemite Distributor now. Or write to Alemite, 1899 Diversey Parkway, Chicago 14, Illinois.

ALEMITE

REG. U.S. PAT. OFF.

MODERN LUBRICATION METHODS THAT CUT PRODUCTION COSTS

Another Product of STEWART WARNER

A
B
C
D
HOW MANY can you identify ?
Do you recognize these HOLTITE fastenings? Guess what industry uses each of them. Check yourself by the list below.

CONTINENTAL makes them all and thousands more

Of all the 400,000 varieties of fastenings that literally hold our industries together, Continental makes a large proportion marketed under the famous HOLTITE trade name. Most of them are standard — screws, nuts, and bolts for every use in every industry. Others like the well-known HOLTITE-Sems and HOLTITE-Phillips screws are patented specialties and the famous HOLTITE-Thredlock, Locktite and Tap screws were first designed and produced by Continental. Sometimes a fastening engineered by HOLTITE for one industry finds an unexpected use in another. Often a HOLTITE-Engineered fastening will replace several parts that a manufacturer is using. Why not discuss your fastening requirements with a Continental Sales-Engineer. He will focus on your requirements all the broad industrial-fastening experience and ingenuity of Continental. Remember Continental is constantly improving HOLTITE products, lowering their cost and broadening service.

ENGINEERED FASTENINGS FOR PRODUCT ENGINEERS

A. A typical flat head HOLTITE steel woodscrew. Continental makes a complete range of sizes with either slotted or Phillips heads.

B. Special Phillips "HOLTITE-Thredlock" door hinge screw eliminates lock washers and other locking devices giving improved performance when subjected to vibration.

C. Dial adjusting screw specially designed for bathroom scales. Screw inserted in frame is swaged against square shoulder under head. Completed part engages scale leveling mechanism to allow screw driver adjustment.

D. Beater drive shaft for a home electric mixer. Continental engineered this unusual part and produced it economically by cold heading process. Head end is welded to the beater unit. Knurled section provides grip for motor chuck.

This Trademark HOLTITE T. M. REG. U. S. PAT. OFF. *means made by —*

CONTINENTAL SCREW COMPANY

1904 NEW BEDFORD, MASS., U.S.A. 1949

time off without written permission from the front office he is weakening his foreman's authority with a consequent loss of effective functions of foremanship in the shop.

Although the Big Boss has final authority on how his money is spent, as a good administrator he still should delegate some of his authority to his foremen. This indicates that he respects the foremen's discretion and judgment. Furthermore, the individual foreman knows better than the front office when a man in his department deserves time off.

I believe that obtaining written permission for time off will have little bearing on absenteeism. Before any dogmatic correction can be applied to the problem, the causing factors should be determined. They may be conditions in the shop or in the personal life of the worker. The most effective deterrent to lost time is the worker's knowledge that his employer practices the best and fairest type of industrial management.

When the ordinary conditions of employment are such as to stimulate interest in regularity and create a sense of loyalty and appreciation on the part of the workers, absenteeism will be kept to an unavoidable minimum. Where the men have a justifiable reason for asking for time off, the granting of leave will be appreciated and the men will come back and work all the better for it. In any event, the foreman should be permitted to make the relatively minor decision without the help of higher authority. The problem should be left to the discretion of the foreman: it's his baby.

Harry Kaufman
Philadelphia, Pa.

•

MEN ONLY?

Ed must have been more fortunate than some of us, with "sweet-smelling shapely babes" on all sides—and in skirts. Personally, memories of work in and visits to metal-processing shops in several countries during the war recalls no "crew of skirts" that could approach collectively, in the eyes of one then not thirty years old, close enough to this classification to qualify as mental hazards. Lard oils, coolants, cutting compounds, torch and arc gases are notoriously efficient neutralizers for Chanel No. 5, to say nothing of wartime restrictions on the use of soap and water, a helper here and there to a certain amount of natural reluctance to cleanliness in general.

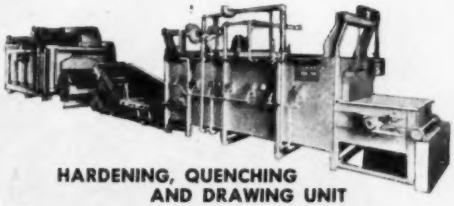
Does Ed's shop forbid the posting

THERE IS A SUNBEAM STEWART INDUSTRIAL FURNACE FOR EVERY NEED
GAS • ELECTRIC • OIL

GALVANIZING

Sunbeam STEWART

THE BEST INDUSTRIAL FURNACES MADE



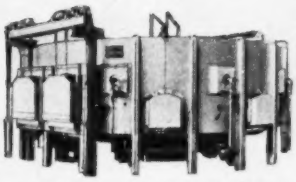
HARDENING, QUENCHING AND DRAWING UNIT

- ***Longer*** **furnace life** • ***Greater*** **production**
- ***Lower*** **operating cost**

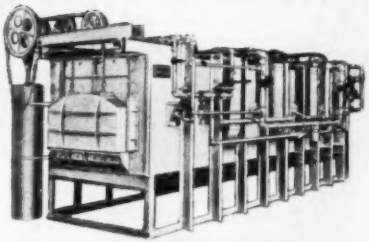
As a division of Sunbeam Corporation we have the opportunity of working with our furnaces in the production of Sunbeam appliances, lawn sprinklers, sheep shears, animal clippers, etc. In manufacturing our own products we must contend with practically every heat treating problem faced by industry —a position unique in the furnace manufacturing field.

This experience with our own furnaces in large volume production enables us to render a service to you far beyond other manufacturers. That is one reason why Sunbeam Stewart Furnace installations have been so successful. They are based not only on furnace engineering ability, but on practical experience under actual operating conditions. We have learned through actual experience the factors that give longest furnace life . . . greatest production . . . best quality . . . and lowest operating cost.

Our highly trained technical staff of furnace engineers who for over 50 years have built furnaces for the leading companies throughout the United States and abroad are qualified to recommend the correct type of furnace to meet your requirements.



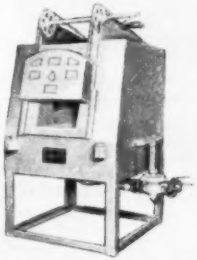
ROTARY HEARTH FORGE



PORTABLE OVEN FURNACE

A letter, wire or 'phone call will promptly bring you information and details on Sunbeam Stewart Furnaces, either units for which plans are now ready or units especially designed to meet your needs. Or, if you prefer, a Sunbeam Stewart engineer will be glad to call and discuss your heat treating problem.

RECIRCULATING FURNACES



SEMI-MUFFLE AND FULL MUFFLE OVENS

SUNBEAM STEWART INDUSTRIAL FURNACE DIVISION of SUNBEAM CORPORATION
(Formerly CHICAGO FLEXIBLE SHAFT CO.*)*
Main Office: Dept. 119, 4433 Ogden Ave., Chicago 23—*New York Office:* 322 W. 48th St., New York 19—*Detroit Office:* 3409 E. Grand Blvd., Detroit 2
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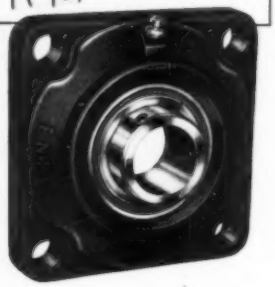
"These great **NEW** products by Boston Gear save you time and money... make your job easier"

Designers ... Manufacturers ... Maintenance Men ... See how you benefit from these new, modern-design pillow blocks and flanged cartridges.

"Take a look at these specifications and advantages..."

"These brand new flanged cartridges and pillow blocks are easily installed ... self-aligning ... quickly serviced. You have less to do all along the line!"



- Bearing is self-aligning. Spherically ground O.D. cuts mounting time because bearing aligns self on shaft.
- Smooth running through a long service life is assured by highest quality alloy steel races and chrome alloy steel balls. Inner race is locked to shaft by two precision ground thread set screws set at 120 degrees.
- New oil-resistant seal of labyrinth design provides dirt-free lubrication chamber. Seal is integral with bearing, permitting unrestricted misalignment of bearing. Design allows excess grease to escape without danger of blowing out seal.
- Bearing is prelubricated and can be placed directly in service. Alemite fitting makes regreasing easy, convenient.
- Rigid mounting provided by solid, one-piece cast iron housing. Slotted holes in base make bolting down quick, simple.
- Both flanged cartridges and pillow blocks are available for shafts $\frac{1}{2}$" to $1\frac{1}{4}$" diameter.

FREE! Send for special bulletin which tells you all about these new Pillow Blocks and Flanged Cartridges.

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Company.....

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City..... Zone..... State.....

One of the world's most complete lines
71 distributors in major cities

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of "girlie" calendars, issued yearly in more revealing and larger colored printing by tool and mill-supply houses? If a man can work with those hanging all around him and not cause worry that his mind may be wandering, why worry about the distractions supposedly suggested by the female form, however divine, swaddled in a cloth, rubber, or plastic apron, overall or coverall, be they rainbow-hued, clean, or dirty-white. Skirt jobs there were and tailor or dressmaker made coveralls too—but the gal thus attired was given shorter time to prove whether the presence of such an outfit was "on company business" or the wearer's.

Ed didn't mention, but doubtless he had it in mind, of how concentration-wrecking a mass of hair of almost any standard hue, beautifully coiffed, can be, and of how some women's conception of that is so much at variance with his. Or could it have been a sudden mental picture indelibly etched on the memory of an hysterically shrieking girl of twenty who, moments before she had been snatched bald-headed (a more thorough job than scalping) by the whirring spindle of her drill press, was justly proud of her long auburn hair, so proud she just couldn't bring herself to wear a snood or cap, such as is now a safety must? Good supervision and/or an incentive system seldom suffer from woman troubles either, Ed.

As to capabilities, there is a heck of a lot less trouble job-classifying a woman who can't make the grade on a machine and fixing her up with bench-work than there ever was, or is, with our wartime and postwar "machinists." These metal-butchers can make more noise in the shop steward's ear, and everybody else's, than a rivet gun, about being upgraded every six months, when actually by union "guild" standards they couldn't pass as an assistant helper to a third-year apprentice.

For straight repetitive hand operations, be they deburring, reaming, polishing, grading, inspection or assembly, with a high ratio of monotony and quantity of material handled to complete unit output, where the physical effort required is low, women make a far better job of it than men, and at a lower cost. Laborwise, this is no refutation of equal pay for equal work; if a man-performed operation is switched to a woman for the foregoing reasons of performance and output, she should receive the same pay. Of course, if it is a new job, savings may be made by setting women on it at the beginning at a rate commensurate with the job-reasoning

PROPER surface preparation is essential to prevent peeling and flaking of paint finishes applied over zinc coated sheets and zinc die castings.

Bonderizing produces a corrosion inhibiting surface on zinc and its alloys which effectively prevents chemical reaction between the zinc and the paint ingredients.

The nonmetallic crystalline Bonderite coating is integral with the metal itself, thus providing a secure anchor for the paint and retarding the formation and spread of corrosion.

Bonderizing for zinc is simple, economical and effective. Investigate it for your zinc production.

TECHNICAL BULLETIN AVAILABLE NOW!

Write today for details on Bonderizing for zinc. Free technical bulletin will be mailed on request.

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PARKER

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2198 East Milwaukee Ave.
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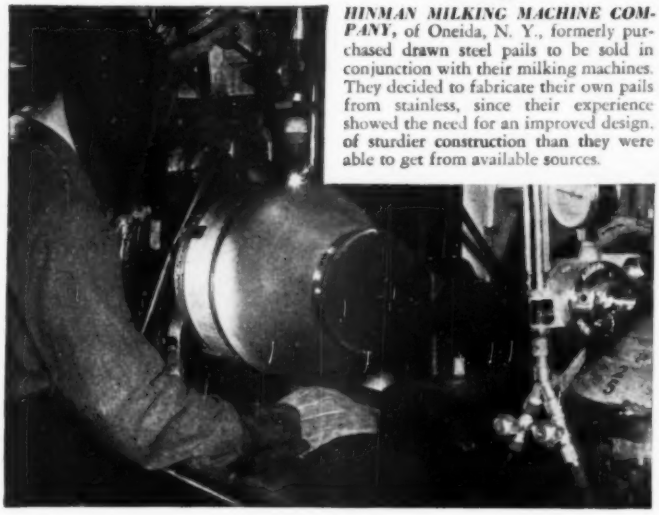
BONDERIZING Holds Paint to Metal . . . PARKERIZING Inhibits Rust . . . PARCO LUBRIZING Retards Wear on Friction Surfaces

Machine Heliwelding turns out a better milk pail at lower cost



HINMAN MILKING MACHINE COMPANY, of Oneida, N. Y., formerly purchased drawn steel pails to be sold in conjunction with their milking machines. They decided to fabricate their own pails from stainless, since their experience showed the need for an improved design, of sturdier construction than they were able to get from available sources.

John View, Airco Technical Sales Representative, was consulted and he suggested the Heliwelding process with the Airco machine holder, using Airco Helium. After Heliwelding, only a small amount of polishing was necessary to finish the job, making the cans ready for shipment.

This method was so successful that the customer was able to produce a top quality pail with a tidy saving in money — and time.

• • • •

TECHNICAL SALES SERVICE — ANOTHER AIRCO PLUS-VALUE FOR CUSTOMERS

To assure its customers of high efficiency in all applications of the oxyacetylene flame or electric arc, Air Reduction makes available the broad, practical experience of its nationwide Technical Sales Division personnel. The collective experience and knowledge of these specialists has helped thousands to a more effective use of Airco processes and products. Ask about this Airco "Plus-Value" service today. Write your nearest Airco office. In Texas: Magnolia Airco Gas Products Company . . . On West Coast: Air Reduction Pacific Company.

AIRCO **AIR REDUCTION**

Offices in All Principal Cities

Headquarters for Oxygen, Acetylene and other Gases . . . Carbide . . . Gas Welding and Cutting Machines, Apparatus and Supplies . . . Arc Welders, Electrodes and Accessories

that in certain areas and certain classifications male-labor base rates are somewhat inflated.

Should Ed have in mind reports or experience of flocks of women at work areas jawing away as though at a picnic "sociable," he should be reminded again that there is no substitute for good supervision and the best way to get them to "break it up" is to do just that. The slightly more space required to seat the women at one side only of a bench of work area, facing in one direction only and in a group of odd numbers so there is less chance of conversational pairing would be more than compensated for by increased output, as well as a certain amount of reshuffling of personnel occasionally to part a conspicuously talkative pair, will take care of the major causes of such a problem.

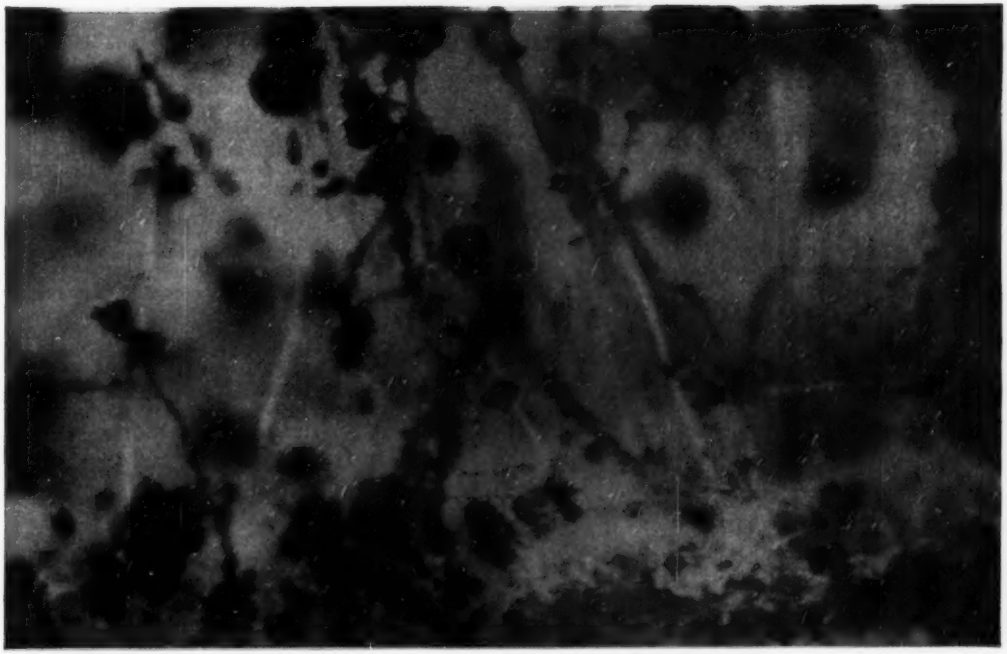
Ed's sneering at reports of women as effective wartime motor mechanics is understandable when one remembers the drove of stories we have built up over the years concerning women drivers and their affinity for garage doors. My memory of a young "shapely babe," changing a front tire on a 2-ton Red Cross truck in a blackout, with no per-war experience except riding the custom-built chauffeur-driven limousine of her parents, makes it hard to appreciate most of his reasoning. In the back of my mind lurks a sneaking suspicion that Ed, while a great exponent of female frailty, probably thinks nothing of letting his 118-lb. spouse do a weekly wash for a family of five entirely by hand.

A. M. Elliott
Leroy, N. Y.

•

The reason more women are not employed in Metalworking is the under-estimation of their capacities by prejudiced employers. In the majority of the plants, the foreman, directly or indirectly, hires the help. He is the first to voice an objection, and if he is pressed to employ a woman, will make her very uncomfortable to prove his point.

Even during the war, when women were brought into the machine shops, they were not given a reasonable chance to prove their worth. Unfortunately, there were insufficient experienced female supervisors to train or manage the feminine operators. The conceited male did not take his teaching seriously and gave the females as little help as possible. Many foremen discouraged the ambitious and burdened the patriotic with monotonous detail. In most cases they tried to make tasks as complicated as pos-



An example of Aspergillus Niger or "Blue Mold"—a common mold magnified seventy times.

stop feeding your profits to fungi!

How much profit are you losing to mold and bacterial action? These microorganisms cause costly material waste and production delays by attacking lubricants and coolants—making them go "sour."

Now you can effectively control such losses with Dowicides, Dow's industrial germicides and fungicides. Production men have learned to depend on Dowicides for extending the service life of cutting, grinding, rolling and hydraulic soluble oil emulsions. Available in both oil and water types, Dowicides are particularly suited to incorporation in industrial oils and coolants to prevent attack by bacteria and fungi.

Investigate Dowicides now. Protect your profits from the bugs! Complete laboratory facilities are maintained by Dow to help you solve your problems. Just contact your nearest office or write direct to Midland.

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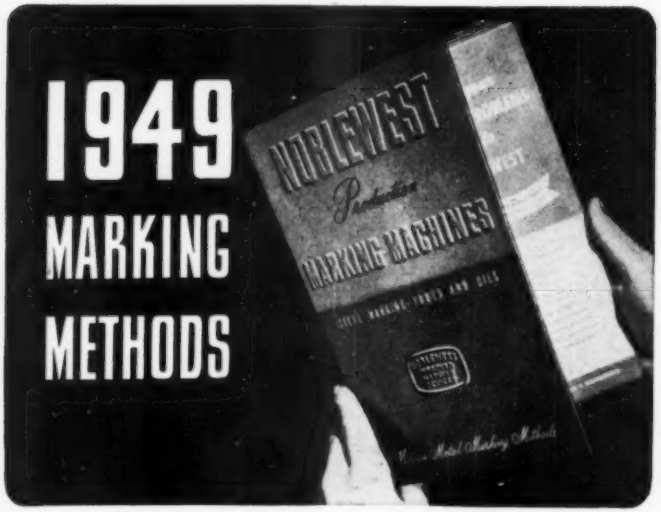
CHEMICALS INDISPENSABLE TO INDUSTRY AND AGRICULTURE



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MARK IT BEST WITH NOBLEWEST IMPROVED MARKING DEVICES

NOBLEWEST

EQUIPMENT FOR MARKING · GRADUATING · EMBOSSING · NUMBERING

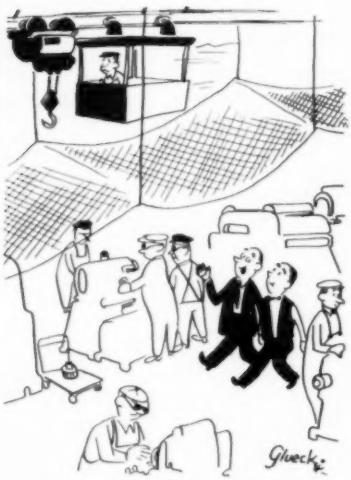
sible to exaggerate the knowledge required and build up their own importance.

The "disturbances" or lowering of morale was caused by the men, not the women. Most of the women wanted to work or learn a trade, but the dominant male wanted to display his superiority. The man was the aggressor in flirting and dating in most cases.

The ability of the feminine worker is limited by her physical capacity. Expecting a woman to handle heavy pieces or operate bulky machinery is unreasonable. Every foreman has certain men to handle certain work and does not put a 115-lb. man on a job where a 185-lb. man would be more advantageous. He should use the same discretion in assigning tasks for women. The management can readily determine where women can be used in conjunction with men.

The woman worker in general is more anxious to progress than the male. When she learns one phase of the job, she wants to step up. If she finds that her possibilities are limited, she packs up and leaves.

An incident which amused me occurred during the war on the shell production line where I was employed. If the flow of shells slowed down on the inspection bench, the men would "soldier on the job" or take a walk. The women would pull up a box and read the paper. When I inquired about the "sitdown" the women would frankly point out that there was no work, while the men



"He insisted on the safety net to keep the men from throwing things at him."

Amazing, New BLACK & DECKER 3/8" Electric IMPACT WRENCH $105.00

★ For SPEEDY running and removing of NUTS, BOLTS, CAP SCREWS, LAG SCREWS up to ⅝" thread size.

★ Makes SHORT WORK of removing FROZEN, RUSTY nuts and bolts!

★ SAVES time and labor in Metal Fabricating; Assembly Lines; Engine and Machinery Rebuilding; Garages; Truck Fleets; General Maintenance; Railroads, etc.

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★ DELIVERS 2000 BLOWS per minute to hammer fasteners loose or drive them home—in a few seconds! (Free running speed: 1600 R. P. M.)

★ Operator fatigue reduced to AMAZING MINIMUM . . .

NO { jarring / twisting / fighting the wrench

★ So WELL-BALANCED, operator can control Wrench by holding it *lightly* with one hand.

★ Trigger switch for easy operating control, right or left hand. Toggle reversing switch positioned for fast, convenient thumb operation. FORWARD—REVERSE—in an INSTANT!

★ Famous full-powered B&D-built motor CAN'T BE STALLED—even when spindle is stopped dead—no danger of overload or burn-out!

IF you've ever "ridden" a heavy nut runner all day long, you know what a difference this light-weight, high-powered sturdy Impact Wrench makes in time-saving, fatigue-saving, cost-cutting! Ask your nearby Black & Decker Distributor for a demonstration. Write for free, descriptive literature to: The Black & Decker Mfg. Co., 616 Penna. Ave., Towson 4, Md.

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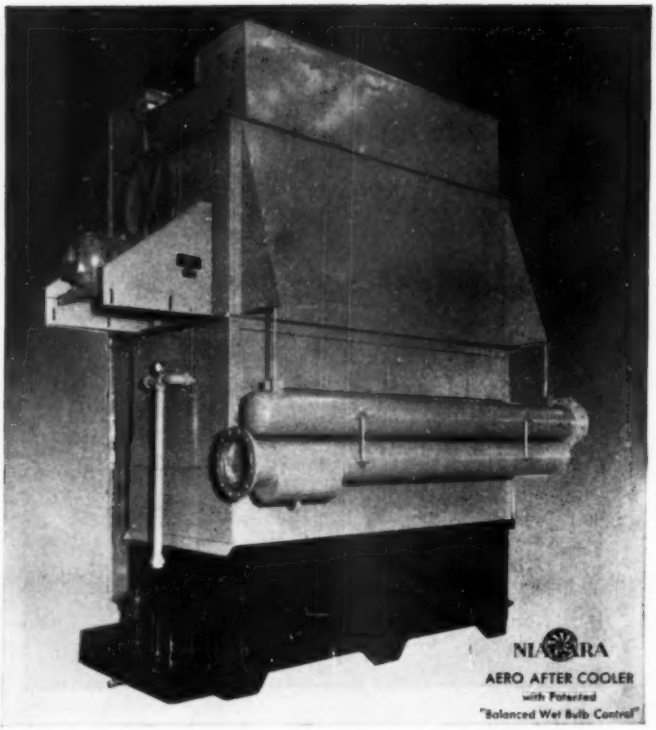

How to PREVENT CONDENSATION in COMPRESSED AIR LINES

● Users of pneumatic tools and machinery spend thousands of dollars on repairs and suffer much interruption to production from the condensation of water in their air lines. In compressed gas systems and in processes where compressed air is blown directly on parts and materials in production, there is additional damage.

You can prevent these losses by installing a Niagara Aero After Cooler. It cools the compressed air or gas by evaporative cooling and removes the water before the air enters the receiver. This method brings the air to within a few degrees of the wet bulb temperature, making certain that your compressed air will always be colder than the atmosphere surrounding the lines in your plant, so that no further condensation can take place.

Savings in cooling water pay for the installation. Experience shows that the patented Niagara evaporative cooling method consumes less than 5% of the water required for cooling by conventional means. You save the cost of the water, the cost of pumping it, the cost of disposing of it. These extra savings soon pay for the Niagara Aero After Cooler.

Write for Bulletin No. 98 AM

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HUMIDIFYING • AIR ENGINEERING EQUIPMENT

would inspect the same shell a dozen times to give me the impression they were busy. This happened frequently on other parts of the line, with the same effect, and I admired the women for their honesty.

Many plants operated on a "cost-plus" basis during the war and used women employees to pad the expenses of operation. Both employer and employee received no benefit from this relation. The employee received no constructive experience and the employer neglected the possibilities of developing a potential labor bank for post-war production.

Frank J. Zarnowski
Rutherford, N. J.

•

The letter of my friend John Homewood regarding women in the shop has much to commend it. It also recalls an incident following World War I, when women were inducted into toolrooms, probably for the first time. I was visiting a large plant with the manager, who pointed out the woman, saying that the toolroom foreman had objected seriously to having a woman in his department. But she was a good toolmaker and they kept her. The foreman, the manager told me, was a rough-talking bird but the woman got along without any trouble. When I asked him for details, he smiled and said, "She can outcuss him any day." . . . Not the best of recommendations perhaps, but it kept her on her job without the drawback of an inferiority complex.

F. H. Colvin
Point Pleasant, N. J.

•

BLUE DEVILS

It is easy to ridicule the idea of Bill's "blue devils" as justifying the taking of a day off. To accept this as a matter of course would be to open a very wide gate. Most users of such a gate would be those whose "devils" would be entirely imaginary, being unaccompanied by the mental disturbance felt by Bill.

To attempt to suggest any kind of rule to deal with the condition would be foolish, but there is a case. Some time ago, one of your "Round Table" characters went away for a holiday and got into trouble on the way. He was disposed to blame the journey. It is not unlikely that he was suffering from an attack of "blue devils," due more to his need for a holiday than the journey itself. Brain fags or physical disability can quite easily rouse "blue devils." Patience goes, nerves get jumpy, concentration is

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You as a gear manufacturer under present industrial and market conditions can correctly evaluate production equipment that:

❶ Assures extremely close gear tolerances consistently.

❷ Does not require any mechanical skill to operate.

❸ Eliminates operator fatigue and its effect on morale.

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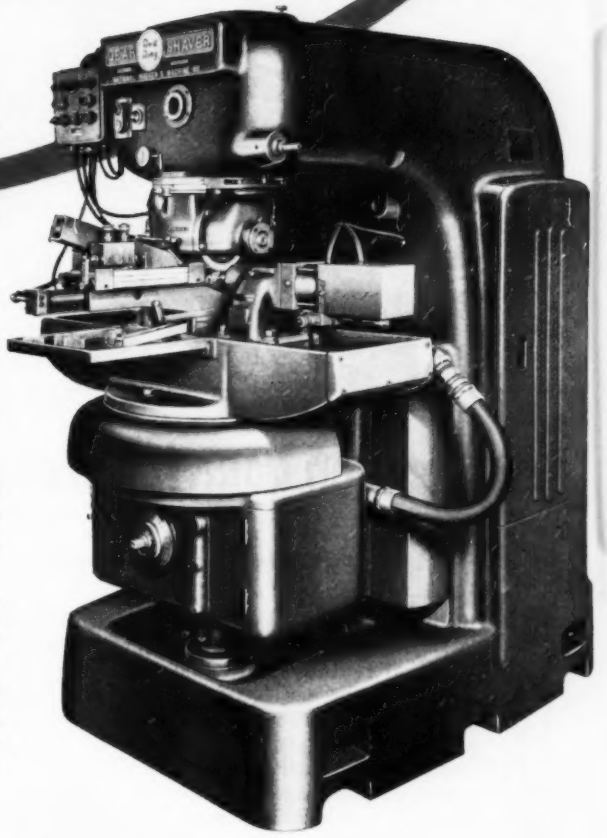
Either of these machines so equipped can be run continuously merely by keeping a supply of work gears in the magazine and removing the finished gears. One operator easily serves a battery of machines, for the entire machining operation is entirely automatic.



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To help you with your threading problems, Threadwell maintains a nationwide staff of factory trained field engineers.

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difficult and for the time being, the individual can be less sound mentally than usual.

Sickness of the brain should be considered as being as normal as one of the body. To ignore either can be unwise. If the works doctor were a psychiatrist, as well, such cases as Bill's could be dealt with, with knowledge instead of banter or ridicule. Merely to ridicule is not unlike the proverbial ostrich when faced with danger. Failing skilled diagnosis, the common-sense foreman will know his men, and his leg is not likely to be pulled more than once.

The influence of the physical over the mental and, perhaps, vice versa is indicated by the fact, as put by a medical friend of the writer. He said that statistics show that more minor accidents take place on dull than on bright days, poor light not being the only reason. Blue devils, perhaps?

P. E. James
Lincoln, England

•

VISITOR'S DAY

A foreman or a workman who is really interested in his job and is ambitious usually cannot only enjoy but profit by visiting at another shop.

It is not best to crowd one's way into another plant, but where friendly and liberal relations are in effect, there is a good prospect for gaining knowledge.

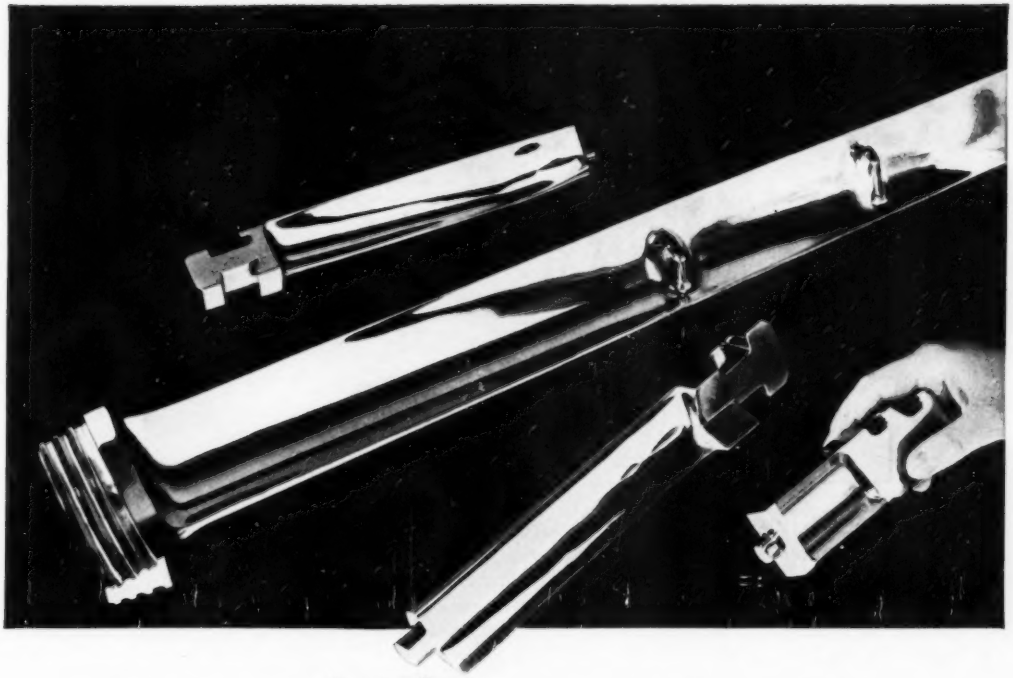
However well-informed one may be about the shop and the work where one is employed, some other shop (whether engaged in the same particular line or not) will be doing some things in a different manner. Some may be found advantageous—and in some cases the visitor may advance ideas that will be helpful to the entertaining friend. Those who freely give usually receive in like terms.

Visits to other shops have been entertaining and helpful to me, and I have also received much help from others who visited in the shops where I have been employed.

Abel Blakeman
Watervliet, N.Y.

•

I believe that a foreman should visit other companies occasionally on his employer's time. This gives him the opportunity to see what the other company is doing and how it is doing the job. It also presents to all foremen the opportunity to get the other fellow's point of view. If Al and Harris have the proper consid-



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HY-TEN *and* AISI

eration for each other's methods and ideas, and so combine them, they may both achieve something they have wanted to achieve for a long time.

We must not lose track of the fact that if each talks in terms of the other's interests, they are sure to come up with ideas. There is no better way to learn things than to get the other fellow's point of view, his methods and ideas. This company, which is paying Al to visit another company, has shown one of the fundamental principles of good human relations. It makes Al feel important and has more or less given him the opportunity to exchange ideas which may later benefit his employer.

A. E. Salmons
Philadelphia 29, Pa.

•

It is "penny wise and pound foolish" for a company to claim that having its foremen visit other plants for interchange of production ideas is an unnecessary expense. Progressive foremanship demands that a foreman go visiting occasionally on company time, for by so doing he is helping his employer as well as himself. As a result of visiting another shop, he will usually come back with some money-saving ideas and possible solutions to his own problems. Both parties to such a visit stand to benefit from a mutual exchange of ideas. The old-fashioned "swapping post" idea can be utilized successfully in modern industry. Visiting other plants is a good variation of the "swapping post" and "cracker barrel" meeting where ideas and experiences could be exchanged.

Swapping opinions on experiments, failures and successes as well as discussion of innovations, methods and kinds may have all the earmarks of the old-time "cracker-barrel" meetings, but it should not be forgotten that "we may wear cleaner shirts now but still roll up our sleeves to scrape the barrel for new ideas."

A foreman who has initiative will welcome the opportunity to use it in exchanging ideas and experiences with foremen at other plants. Interchange of foremen will broaden their knowledge and experience, and prevent them from getting into a rut on their regular jobs and as worn-out of new ideas as a woodpecker in a petrified forest.

It should be noted that in line with the policy of interchange of foremen, swapping jobs is not contemplated. All that is being proposed is that the visiting foreman will be

Here's where

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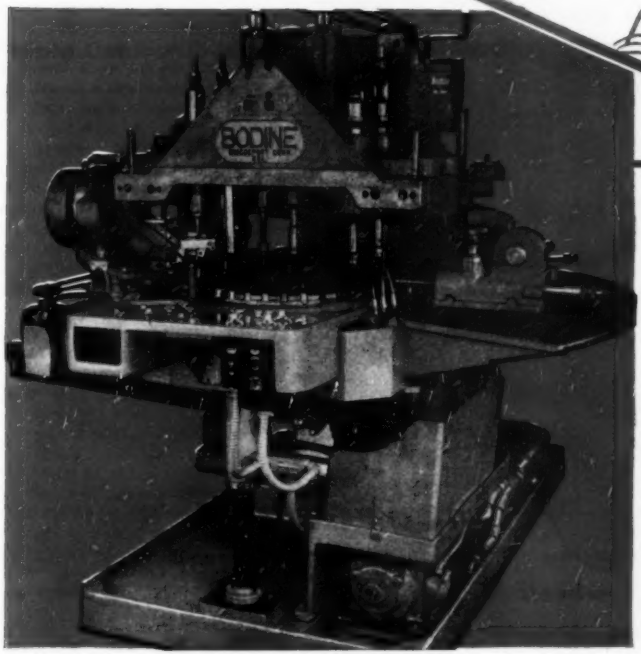
means Substantial Savings



The center of activity in a Bodine automatic Multiple Spindle Milling, Drilling, Tapping and Screw Inserting machine is around the circle of the horizontal indexing table. Small components are carried to working stations where tools are located to operate vertically, horizontally, diagonally or even from an inverted position. Thus a great variety of tooling combinations may be arranged . . . for high speed cost-cutting production.

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We suggest that you permit our engineers to do some "thinking in circles" for you . . . to provide the exactly right machine and tooling for your specific job. There's inspiration for production executives in the new Bodine Bulletin . . . **send for your copy today.**

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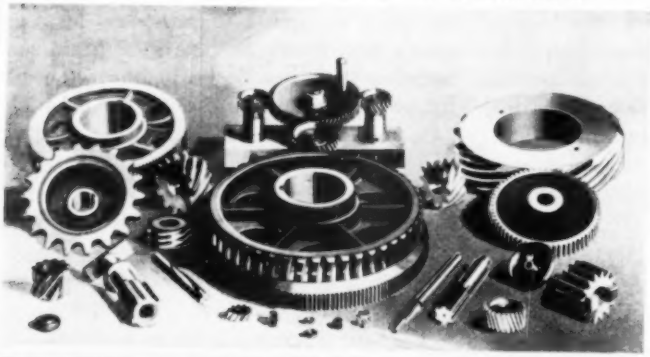

The LEES-BRADNER Company
CLEVELAND 11, OHIO, U.S.A.

the guest of the foreman of the plant being visited, and spend the day going over their mutual experiences, methods and problems. At some future date the visit will be reciprocated, with new problems the subject of discussion.

As far as having an understudy take care of the foreman's duties while he is away visiting is concerned, it is believed that having a well-trained number two man on hand to provide continuous successful operation of a plant is a must in the rules of good management. A substitute for each foreman within an organization is essential, and unpredictable changes make it necessary for management to keep or tap a supply of key men. The foreman who provides for an understudy is a far-seeing intelligent man. He is doing a good job of being a foreman in his present shop if he can step out, and leave an understudy he has trained, to carry on effectively. How else can he himself get ahead?

"A rolling stone may gather no moss," but a visiting foreman can certainly pick up profitable ideas in going over mutual problems with another plant's foreman. To those who question the value of a foreman visiting other plants in quest of new ideas and in an effort to broaden his own capabilities and worth to his company, it might be well to remember this quotation: "There exist limitless opportunities in every industry. Where there is an open mind, there will always be a frontier."

Harry Kaufman
Philadelphia, Pa.

•

A foreman certainly should go visiting on company time *with expenses paid*. When he stays in one place too long, he will get stale. When he thinks he has top efficiency before a visit, he will be surprised at the number of little things he can find to do better if he will just take the trouble to look around. Boy, oh boy, he will find a thousand new ideas that he didn't dream about, a little short cut here or there, if he knows the foreman in the other plant! What's more, he can swap ideas and everyone will benefit. He can tell the other foreman then and there that he is willing to cooperate thereafter as well.

Let me demonstrate: During my vacation I stopped over in a town in which was the shop of a pneumatic tool company. I introduced myself and asked to visit the shop. They took me through, and I picked up a lot

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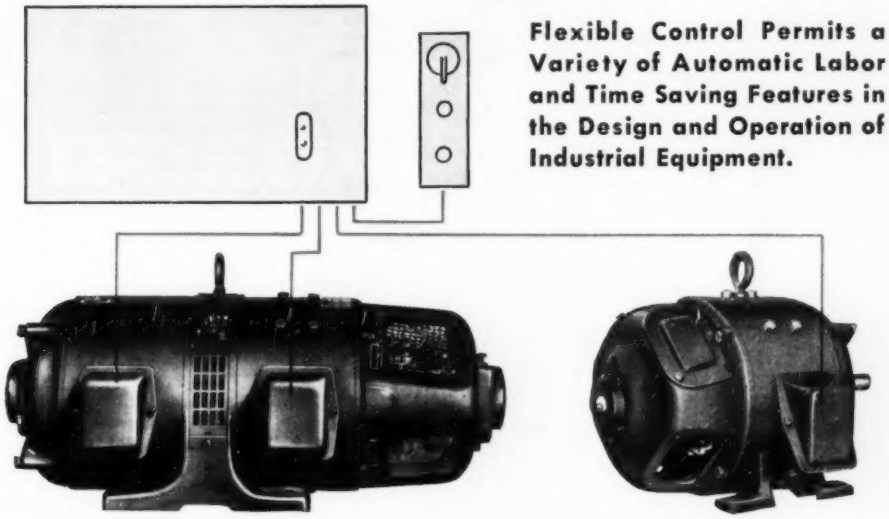

Flexible Control Permits a Variety of Automatic Labor and Time Saving Features in the Design and Operation of Industrial Equipment.

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Another asset is Lovejoy's exclusive "positive-locking" device. This means that a minimum of stock must be removed when sharpening blades. It allows use of a large percentage of each blade. It holds blades immovably even during heavy intermittent cuts.

The Lovejoy man near you will be pleased to give details and production estimates on your own work.

"TOOL BITS"

Type "A" face mills are available for all standard arbor mounts (National and Lovejoy) and standard spindle mounts (National, Ingersoll, Universal, Giddings & Lewis and Lucas). Details will be found in Lovejoy Catalog No. 28. If you have unusual jobs requiring special cutter designs, call on Lovejoy the "specialists on specials."

Lovejoy
TOOL COMPANY, INC.
SPRINGFIELD, VERMONT

Write for Catalog No. 28

of ideas to use. I even gave them one: In their stockroom, which includes thousands of items, their parts' numbers did not run in numerical order. I found out that was because a lot of their machines were obsolete and the spaces they left were filled with parts for new machines in haphazard order. When I called this to the attention of the manager of the stockroom, he thanked me and they began to change it to numerical order. This was just another case in which the visiting foreman could help the man he visited.

If you spend too much time in your own place, you get so you can't see the forest because of the trees. Visiting makes you see your own plant in a different light and suggests improvements that will repay the company in many ways. The man who was sent visiting will usually feel honored and will do his best to live up to the trust that was placed in him—and other men will try to earn a like opportunity. As a matter of fact, when the foreman goes out it gives the man he is training to take over a chance to see what he can do, and this helps also.

Michael Axler
New York, N. Y.

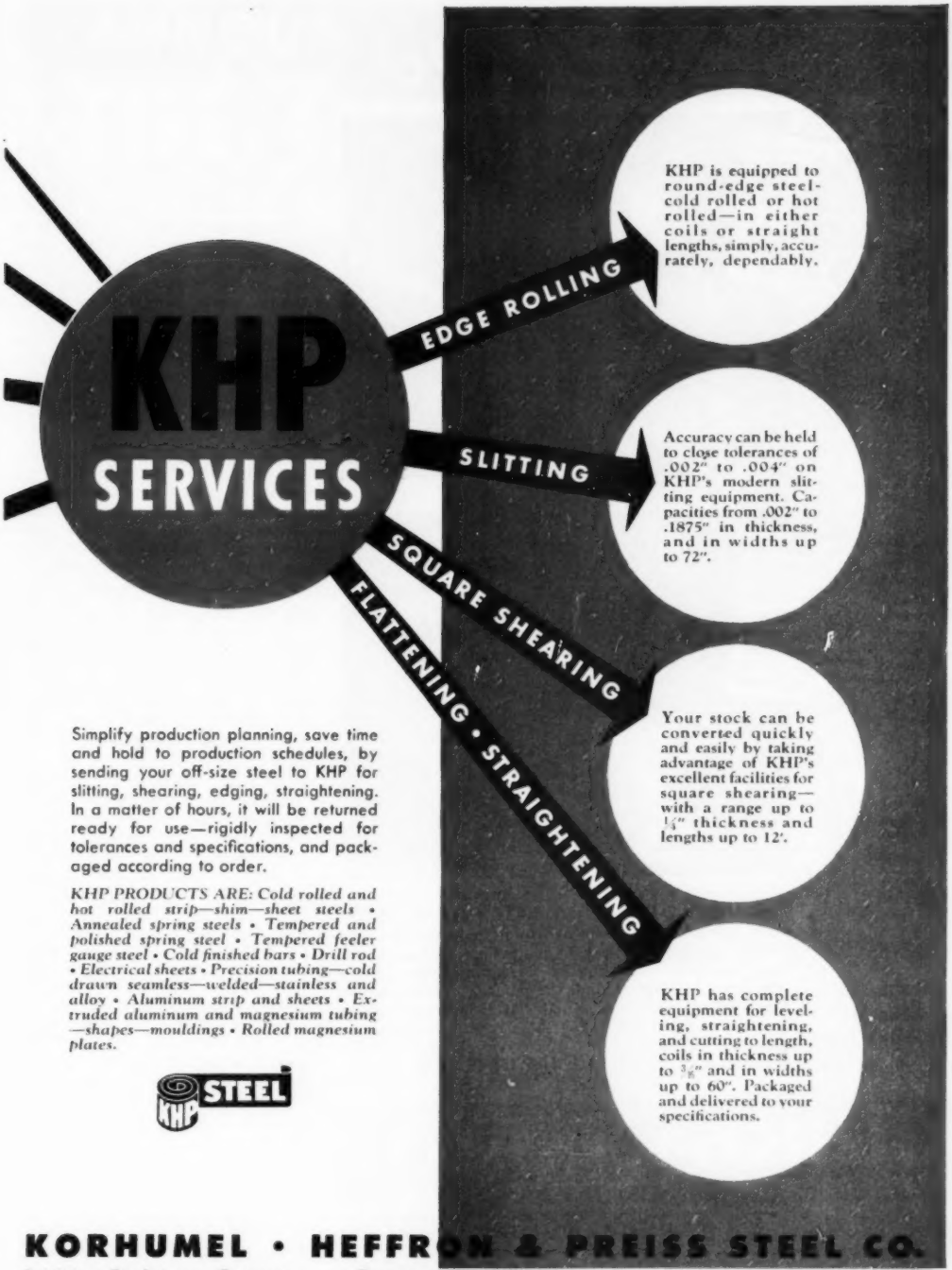
■

There seems to be no doubt that periodical research by a foreman is beneficial to him as well as to his employer. It gives the man an idea of how well he's getting along with his own work; it gives him an incentive to greater effort when he sees what others are doing; and, as is often the case, he returns to his own nest with a feeling that he isn't doing so badly after all.

A foreman can get into a rut just as easy as does one who pushes a wheelbarrow or, to be more specific a self-satisfied pedagog filled with a tingling of his own ego. The poor executive is to be pitied, in a way—he's the original forgotten man who is hemmed in by the four walls of his department all day long. Ed (that's the foreman) goes to work in the morning with many problems on his weary mind. He goes to his desk after hanging up his coat and hat and finds a stack of orders, and what not, awaiting his perusal.

The propelling juice tickles the starting bell beneath the chin and from then on the poor guy ducks and parries the old one-two until it's time to quit for the day.

Poor old Ed faces the same deteriorating problems day in and day out and finally develops a good case of gall stones, petrified liveritis, or South Pole projectus. The warm sun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MATERIAL HANDLING *News*

Special metal containers, mounted on skids, holding approximately 5000 pounds of scrap are easily handled by a husky Clark Utilitruc. Fork-truck speed and versatility are particularly valuable in handling metals

No need of a pallet in handling big castings or other bulky units. There's practically no limit to the number of daily chores in a metals plant that can be performed quickly, safely and at remarkably low cost by Clark's 1000-lb. Trucloader

WRITE FOR *Material Handling News* —"must" reading.

TACKLE THOSE HANDLING COSTS! It is one of the surest ways to protect and increase profits, say Industry's wisest counsellors; and one of the few remaining opportunities for appreciable savings. The Clark Method expands the capacity of any business by speeding up the flow of material. It increases storage capacity without plant expansion. It minimizes demurrage and costly accidents. It is good common-sense — and now is the time — to CONSULT CLARK.

CLARK ELECTRIC AND GAS POWERED FORK TRUCKS AND INDUSTRIAL TOWING TRACTORS

INDUSTRIAL TRUCK DIV., CLARK EQUIPMENT COMPANY BATTLE CREEK 3, MICH.
REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE WORLD
AUTHORIZED CLARK INDUSTRIAL TRUCK PARTS AND SERVICE STATIONS IN STRATEGIC LOCATIONS

may be shining on the outside but one wouldn't think so to look at him—he is flooded so with annoying care that one would think it was raining.

The leader of men arrives home and is met by a driving wife. He finds that his mother-in-law is going to spend the winter with him. In desperation he goes out to the garage and looks for a piece of half-inch rope. Finally he unties the knot and says, "Ah, ta Hell with it," and hightails it to bed where he throws his hands behind his neck and thinks, mulls over, and cogitates about that troublesome die or some broken machine that has to be in running condition by the following afternoon. In a fit of absolute exhaustion he drops to his knees, says his little "Now I lay me" and finally turns the switch.

Enervated Ed awakes in the morning, gulps down a cup of black java, stumbles out to the garage and, with super-human effort, steps on the starter. Evidently his divine plea rated an "A" and been given some consideration because just as he enters the building he is met by the smiling super. "Ta Hell with the shop today, Ed; you go back home and get dolled up in your Sunday rags—you're going over to the Offset Whirligig Manufacturing Company and ask for Mr. Costcutter—he'll take you in hand for the day. I've arranged everything—so get goin'"

Old man Costcutter grabs Ed by the hand and introduces himself. "So you're the famous Ed I've been hearing so much about—here, hang up your things and don this coat." Ed is taken through the plant, where his eyes are opened to many new ideas. He discusses various problems with his host and finally his thinking becomes sharper—in other words the man seems to have been relieved of a terrible burden he has been carrying. Ed returns to his own plant a better man in spirit and more valuable to his employer. By taking the day off to get a little outside atmosphere he has become innoculated with a very beneficial vitamin so essential to industrial success.

John Homewood
Ontario, Calif.

•

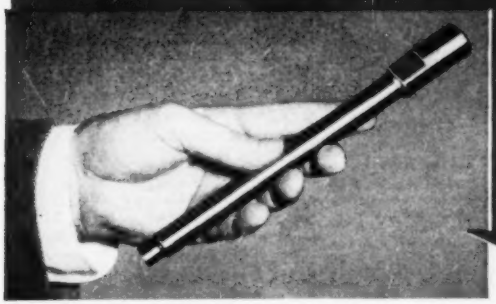
WORKING THE WILLING HORSE

Instead of wearing a good man down with an overload of rush work, the wise foreman endeavors to spread such rush jobs around. More than one worker should be available for extra assignments. From personal ex-

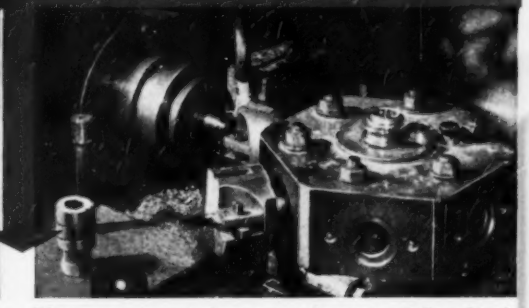
ANNOUNCING . . .

THE "TRIPLE C" PLAN

to help you lower your BREAK-EVEN POINT!



"Doubled production! Held costs down despite rising wages! Savings made in the machining of this one part paid the entire cost of installing the plan!" Large midwestern manufacturer.



"Assures maximum tool economy and accurate grinding of intricate form tools so important . . . in a highly competitive field." Top-ranking Detroit manufacturer

Now! . . . get even greater savings from your use of carbide tools!

NOW it's ready for *your* plant!

A plan that combines *all* the elements of successful, efficient use of carbides by many prominent manufacturers!

Based upon years of field experience, Carboloy Company now offers *you* these valuable findings in a single plan of Coordinated Carbide Control (the "Triple C" Plan), *to help you obtain every possible production economy from your use of carbides!*

Break-even point too high?

Then this may be the most valuable message you could read today! Wherever the CCC Plan has been tested, wherever it has been put into effect, the results have been astounding:

The plan has doubled, and often tripled, machine production, lowered machining costs in the face of steadily rising wage and material costs—*with no increase in man hours or man-power, no plant expansion, no major capital expenditure!*

And "Triple C"—Coordinated Carbide Control—can be put into effect by your own men.

The results described at the top are *typical*. Names will be furnished on request.

Let "Triple C" help you

It's ten-to-one that the "Triple C" Plan can help lower your break-even point through greater savings. Write today for the free booklet describing the plan in detail. It's available to management executives of manufacturing companies. No cost or obligation.

Carboloy Company, Inc., 11149 E. 8 Mile Road, Detroit 32, Michigan

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COORDINATED CARBIDE CONTROL
THE CARBOLOY "TRIPLE C" PLAN
FOR EVEN GREATER SAVINGS WITH CARBIDES

CARBOLOY
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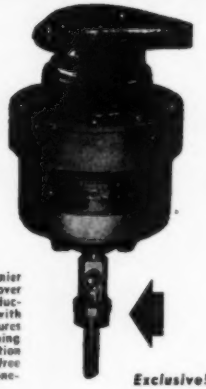
HERE IS PRODUCTION NEWS!

Now you can

LOWER TAPPING COSTS while maintaining TAPPING PRECISION



Exclusive!
"Tru-Grip"
Tap Holder

Lighter, smaller, it affords easier tapping close to walls or shoulders, eliminates "chewed up" tap shanks.

If your problem is precision production at lowest cost—this Procunier tapping head is a production tool it will pay you to investigate. For over 30 years Procunier high speed tapping heads have been keeping production costs down . . . turning out faster precision production tapping with less spoilage, fewer broken taps. The many exclusive Procunier features which can aid you in cutting tapping costs, without scrificing tapping precision, include: the unusually sensitive Procunier double-cone friction clutch; the heat treated gear mechanism which assures long, trouble-free mechanical life; the ball bearings for *continued* accuracy; the simple one-hole lubrication, as well as many others.

Before you *order any* production tapping equipment . . . get the details on Procunier—the tapping heads that deliver *quality tapping at lower cost!*

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HELPFUL DATA FILE

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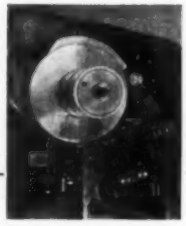
How Built in SAFETY of



PRESS-RITE PUNCH PRESSES

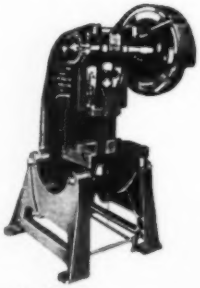
CUTS PRODUCTION COSTS.

New built in non-repeat single stroke safety mechanism and the automatic cam actuated brake increases operator efficiency . . . increases production . . . reduces rejects, resulting in lower cost per unit produced.

OTHER OUTSTANDING . . .

Cost cutting features include:

- Anti-friction roller bearings in flywheel
- Greater shut height clearance
- Triple ramway lubrication
- Heavy duty reinforced frame



6 MODELS
5 to 30 TON CAPACITY

See the PRESS-RITE open back inclinable presses at your dealers, or . . .

WRITE FOR BULLETIN No. P-348A

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perience, I have found that workers will rise to fair challenges. You will yourself.

Suppose that you are a machinist in a small efficiently run shop and a rush job comes up. If your boss tells you that you have to stay longer for three days to get it finished you will gripe and feel sorry for yourself. But suppose that he says, "Joe, we have an important job here that we have to get out by Thursday noon. I'm going to turn it over to you. Will you see what you can do?" With such a trust, you will, if you are normal, throw yourself into the job enthusiastically, work the extra time, and turn in a bang-up job.

Another way to build up dependability on the part of the workers is for the foreman to show that he understands that what people want most of all is appreciation. Most people feel a deep hunger for praise. It gives them a sense of personal achievement. Even the sourest grouch secretly yearns for a little honest recognition of his merits. A wise boss is able to find something to commend in even the least competent man on his staff. He also knows he can get superior results in getting a rush assignment out on time by giving the praise even before his man begins the job. For example, he will say, "Bill, you're one of our best men. Will you try to figure out a way to short-cut this special job so that we can beat our previous estimate on it?"

Because the willing work horse doesn't seem to object to extra work is no indication that he is taking the added burdens in the best of spirits. A smouldering fire or resentment often leads to action that is not in the best interests of the company; the other workers usually form opinions that the man is unduly picked on, and general morale suffers.

Many men don't complain when unjustly treated; but silence does not imply consent to overwork. Some foremen are so used to hearing complaints that they lose their sense of proportion in dealing with a type of worker who doesn't complain even when there is justification for complaint. Such a situation reminds me of the wife who said to her husband, "You'd better get up and go see why the baby's not crying."

The wise foreman should know the physical and mental capabilities and capacities of his men and be able to judge the probable effect of increased work assignments on their health and well-being. It is better to be able to retain the services of a good worker than do him the disservice of

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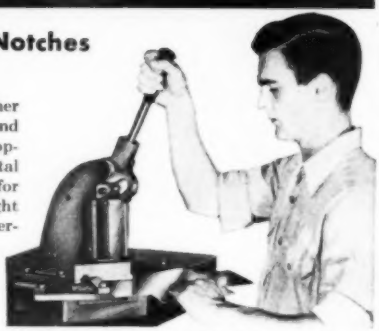
THE di-acro NOTCHER

Duplicates Precision Notches WITHOUT DIES!

The new precision DI-ACRO Notcher eliminates the need for punch press and dies on many production notching operations. It is also ideal for experimental work as it can be quickly adjusted for any size or shape notch. Many straight shearing operations can also be performed with this flexible unit.



CUTS CLEAN—NO BURRS OR ROUGH EDGES

The powerful DI-ACRO Notcher has an exclusive roller bearing cam design which provides a tremendous pressure with a small amount of effort. The precision-ground Vee-shaped ram and blades of alloy tool steel assure clean cuts and permanent accuracy.

LARGE CAPACITY. The DI-ACRO Notcher cuts 90° notches up to 6" by 6" in 16 gauge steel in one operation. Larger notches, and wider or narrower angles, can also be obtained.

SEND FOR 40-PAGE CATALOG. Gives full information on all six "DIE-LESS DUPLICATING" production boosters—DI-ACRO Benders, Brakes, Shears, Rod Parters, Punches, Notchers—with many examples of accurately duplicated parts.

DI-ACRO is pronounced "DIE-ACK-RO"

DI-ACRO PRODUCTION EXAMPLES

O'NEIL-IRWIN MFG. CO.
311 EIGHTH AVENUE, LAKE CITY, MINN.

forcing unwanted extra work upon him, with deleterious effect on his health and value to the organization. Delegating the rush assignments to other members of the force will create a good reserve of experienced workers and keep the rugged willing horse from becoming a ragged worked-out individualist.

Harry Kaufman
Philadelphia 26, Pa.

•

To pick out one particular person for doing rush jobs is decidedly unfair—not only to the man, but also to his fellow workers. Usually the "work horse" is lacking something in his makeup and tries to cover it up by a desire to please. Invariably you'll find that he is disliked by his fellow workers for several reasons: He is, in a way, very unsocial; the fellow leaves a trail of carelessness wherever he works—he is very inconsiderate of the other fellow and leaves the machinery in an unclean condition. The interest of the machine on which he works is secondary—to his way of thinking, the job's the thing, regardless of upkeep.

I know of one "willing horse" who was so irritating to the other men that they were on the verge of going nuts—even the foreman, responsible for the condition of things, gave evidence of hearing bluebirds singing at times. The habit of turning out work in a hurry grew on him so much that he couldn't be a regular human being. Old High Power would rush his way around the shop, register undue impatience at the tool crib, and swear a blue streak when some trifling thing hindered the progress of his work. The boys finally got so

"I have a complaint to register against putting that buffing machine so close to mine."

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They're RIGHT for the job!

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Here's help

for shops machining stainless steel

THE increasing use of stainless steel is presenting new machining problems to many shops. D. A. Stuart Oil Co. has collected much valuable information on this subject from long experience and is particularly well qualified to assist the industry. For example: a Wisconsin plant had tried a wide variety of oils for tapping Type 310 stainless and was still getting but 50 holes per tap. With Stuart's ThredKut 99, used straight, they had secured 550 holes with one tap. In another plant, a Type 304 stainless steel union being made on a Cleveland Automatic was a slow and unprofitable job. A change to a 6 to 1 blend of Stuart's ThredKut 99 increased output from 18 to 31 pieces per hour and this is now one of the more profitable jobs in the shop.

These results are not exceptions, nor does D. A. Stuart profess to work miracles. It is simply that study plus trial and error on thousands of stainless steel machining jobs has given the company a worthwhile fund of knowledge on the subject. This experience and information is available to anyone interested in getting better finishes, longer tool life or faster production on stainless. For further information write, or call a D. A. Stuart representative.

STUART *service goes with every barrel*

D.A. Stuart Oil Co.

2729 S. Troy Street, Chicago 23, Illinois

that they would either duck behind something when they saw him coming or else salaam him with all the necessary gestures befitting one of Oriental station.

He was forced to eat his bag of oats in a secluded corner, because of self-earned ostracism, then stood at the post awaiting the snap of the bell. His willingness to please the boss was greatly offset by the disagreeable situation created among the other workers. This two-legged termite bore in his damndest every time the boss assigned him a job until one of the men, appointed by the rest of the workers, informed the foreman that they seriously objected to any one man so disorganizing the shop by his rushing tactics.

The foreman finally saw the light and agreed to distribute the emergency jobs among the other men throughout the shop. The foreman was a good sport about the whole affair and delegated himself as the re-educator for the job of salvage. The boss had a job on his hands in bringing the fellow back into the fold. He had to tell the fellow to take it easy and not to rush the job—a radical departure from the usual—in order to effect the readjustment—because he realized that he had done the man a grave injustice.

Finally, the effectiveness of patient re-education converted him into a cooperative workman—pulling together, not only with the foreman but with his fellow workers as well. So you see, Mr. Foreman, don't send a man to hell before his time by singling him out to do all the rush jobs, even though his nature is such that he is willing to do it.

John Homewood
Ontario, Calif.

•

Ed seems to have the wrong slant on management relations when he thinks it is a good policy to turn every rush job over to the same worker, regardless of how willing that worker may be to accommodate the foreman.

Although there is an implied compliment in so doing, nevertheless the employee feels some resentment, because while he is under the nervous strain of producing the job in a hurry, the other employees just as capable are permitted to go about their own jobs in a calm manner.

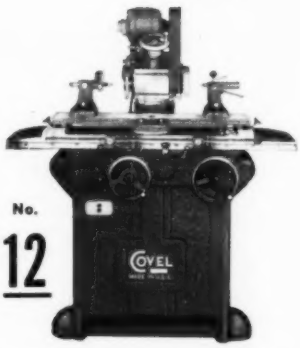
Furthermore, in the haste to rush out the work, there is a strong possibility of errors, and when this happens, the fact is overlooked that the work was produced in a hurry, and only the fact that something is wrong is taken into consideration,

COVEL

UNIVERSAL

Cutter and Tool Grinders

No. 22



No. 12

COVEL will help you cut down the high cost of cutter and tool replacement. When sharpened on a COVEL, tools go back to work with cutting edges perfectly ground—last much longer between grinds. COVEL has helped scores of plants in solving their tool and cutter problems. Special attachments adapt these grinders to a wide variety of jobs—including internal and external grinding.

For Carbide Tools

COVEL builds a special head for grinding Carbide Tools. Rough and finish wheels may be mounted at opposite ends of the Reversible Rotation Spindle. The head swivels 180° to place either wheel in working position, permitting both rough and finished grinding without disturbing work set-up. This head is optional equipment with the 12 and 22.

Send for free illustrated Bulletin A-39A today.

COVEL MFG. COMPANY

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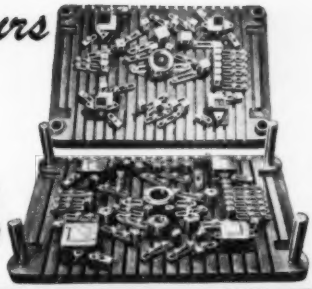
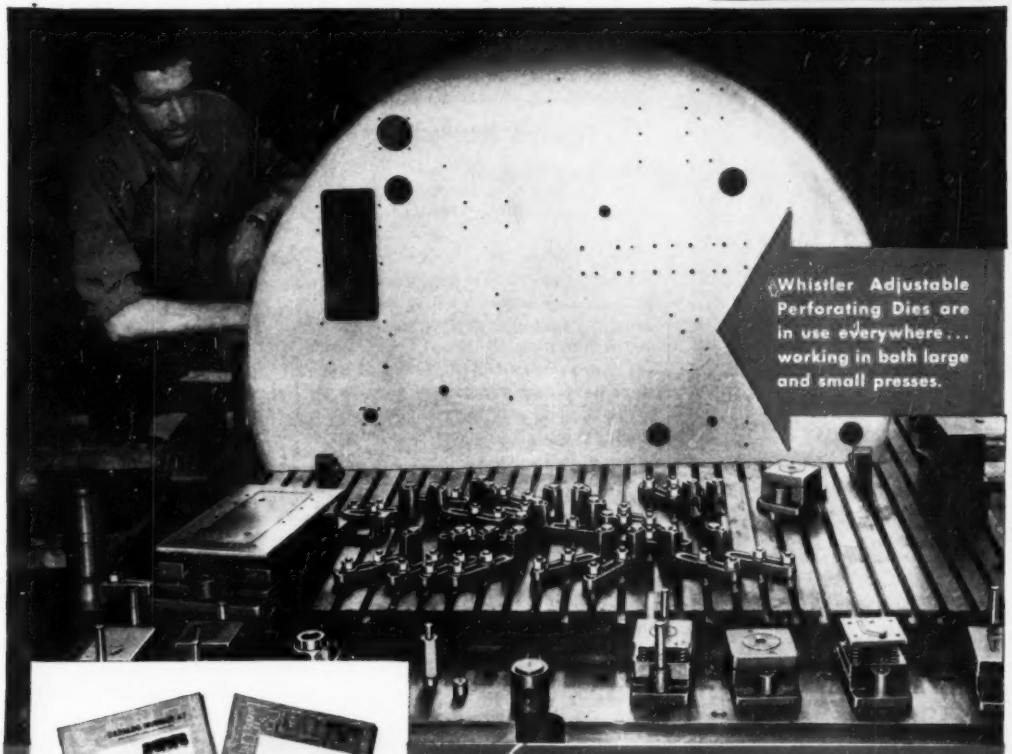
Get into Production in a few hours

with **WHISTLER ADJUSTABLE DIES**





Whistler Adjustable Perforating Dies are in use everywhere... working in both large and small presses.

There are plenty of other advantages in using Whistler Adjustable Dies. It makes sense to get the complete story. And it's easy to do. Write for your Whistler Catalogs today.

Whistler perforating dies now offer a double-barreled advantage in getting into production faster. Standard sizes of round hole punches and dies... 1/32 to 3"... can be shipped promptly. Special shapes... squares, ovals, rectangles, group and notching dies, are quickly made to order.

Equally important, set-ups are simple... take only a short time. Same units can be rearranged or units added in setting up different jobs. Production is thus speeded while die costs are amortized through continued re-use.

No special tools are needed. All parts are interchangeable. The heavy duty series of punches and dies easily pierce materials up to 1/4" mild steel.

S. B. WHISTLER & SONS, Inc.

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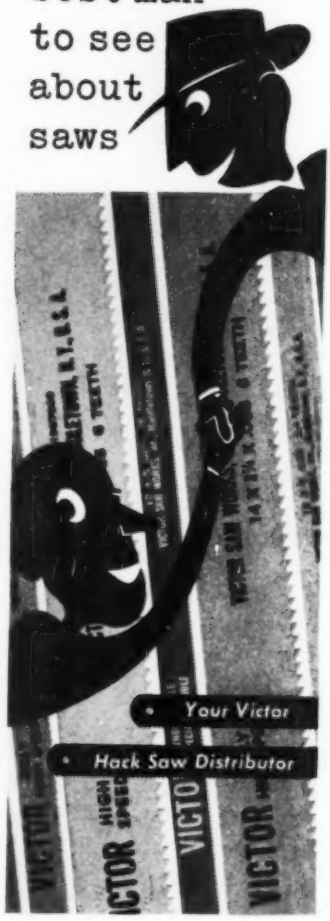
meet the best man to see about saws



Get acquainted with your Victor Hack Saw distributor. He'll be glad to show you how to cut metals and non-metals easier and faster, and cut costs too with Victor Hack Saw Blades.

And while you're at it ask him for the NEW Victor Wall Chart for your workshop — the Victor Metal Cutting Booklet for your pocket or tool kit — both are packed full of helpful information . . . ABSOLUTELY FREE.

5011

VICTOR SAW WORKS, INC.
MIDDLETOWN, N. Y., U. S. A.

with the employee being called on the carpet.

The really fair thing to do would be to distribute rush jobs evenly and impartially, thus eliminating griping or inward resentment, and thereby making for better harmony, which is an essential ingredient for smooth performance in any department.

Milton E. Sussman
Brooklyn 20, N. Y.

"Quotes"

Teamwork Cuts Costs

ONE AUTO MAKER after another, at announcement of new models, explains that retooling costs were $30 to $90 million for the new design —two to more than three times prewar costs. To cut costs, a recent SAE speaker suggests better teamwork between engineering, styling and manufacturing departments.

From our observation, many designs have been reduced in weight by better engineering, without sacrificing strength or performance. Cadillac is a good example—there an entirely new design of cylinder block cut engine weight almost 200 lb., and because the engine cools more efficiently the weight of the brass radiator core is 17 lb. less. These were engineering contributions.

Tool designers have made "transfer" machines where one man accomplishes as much as eight or more men, and with less effort. In the forge shop, the making of extruded steel parts has improved the product, reduced the space requirements 80%, machines required 60% and the manpower 65%. Moreover use of induction heating has made the forge shop more comfortable.

Conveyors are another must if production costs are kept down. The latest developments indicate that overhead rather than floor or bench conveyors are desirable where men have to work around the product during assembly. They leave the floor unobstructed. Materials are stocked at points of use and if possible are not rehandled from the time they are finished until they reach the stock pile on the original pallet. Reduction of han-

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Available in these temperatures (° F)			
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138	288	550	1150
150	300	600	1200
163	313	650	1250
175	325	700	1300
188	338	750	1350
200	350	800	1400
213	363	850	1450
225	375	900	1500
238	388	950	1550
250	400	1000	1600
263	450	1050	

FREE —*Tempil° "Basic Guide to Ferrous Metallurgy"* — 16¼" by 21" plastic-laminated wall chart in color. Send for sample pellets, stating temperature of interest to you.

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2. As Near as Your Telephone. There is a Dayton V-Belt Distributor near you. He is equipped with the specialized knowledge to recommend the right drive for you. You'll find him listed in the classified section of your telephone directory or his representative is now calling at your plant.

3. Instant Maintenance Service from Local Stocks. Your Dayton Distributor maintains complete stocks of Dayton "Drive Proved" V-Belts and pulleys. He is prepared to give you instant service for existing or future drives, and to provide you with an immediate source of mill supplies.

Put this new service to work in your plant now. Equip your drives with Dayton "Drive Proved" V-Belts and be sure you are getting the maximum in drive performance and service. Call your Dayton V-Belt Distributor today. *The Dayton Rubber Company, Dayton, Ohio.*

ONLY Dayton V-Belts are "DRIVE PROVED" for the Job!

Dayton Thorobred—for normal and heavy duty drives.
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dling costs is obviously one of the most obvious contributions which the shop can make to cutting costs.

Metal shortages brought plastics into use in many products; now they are being continued not only for the parts but also for some tooling. Reinforced low-pressure plastics for forming tools are said to have saved one manufacturer $100,000 last year in tool costs. Kirksite dies are finding their way into the automotive industry with marked production savings on parts which are made in limited quantities. It takes teamwork to introduce new designs, new materials and new methods to bring down product costs.

TO THE EDITOR

Acid Machining and Gage Blocks

The article on Acid Machining, *A.M.*, Dec. 16, 1948, recalls a hoax by one of your former associate editors, E. A. Suverkrop, on an engineer of rather high standing who knew moré of engineering than he did of machine-shop practice. "Suver" was much interested in the Johanssen gage blocks when they first appeared and promptly tried his hand at making some gage blocks of his own. His method was similar to that devised by Major Hoke at the Bureau of Standards about 1918, and he afterwards made gage blocks but the venture was not financially successful. The engineer in question wanted to know how Suver made his blocks.

Suver described a simple machine with a very accurate vertical spindle and a precision feed screw with a large, finely graduated wheel on the upper end. The lower, or work-holding end of the spindle was magnetized, he said, and the gage block held firmly against the magnetized plate. Below the spindle was a pan which contained etching acid. To get the precision needed in the thickness of the blocks, the spindle was fed down until the block was just the right depth in the acid, which ate off the metal and gave him a block of exactly the proper thickness. Those of us who heard the explanation had a sudden call elsewhere, but Suver kept a straight face, and so far as we could tell, the engineer swallowed the tale hook, line and sinker.

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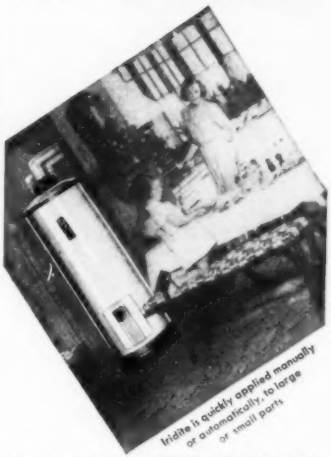

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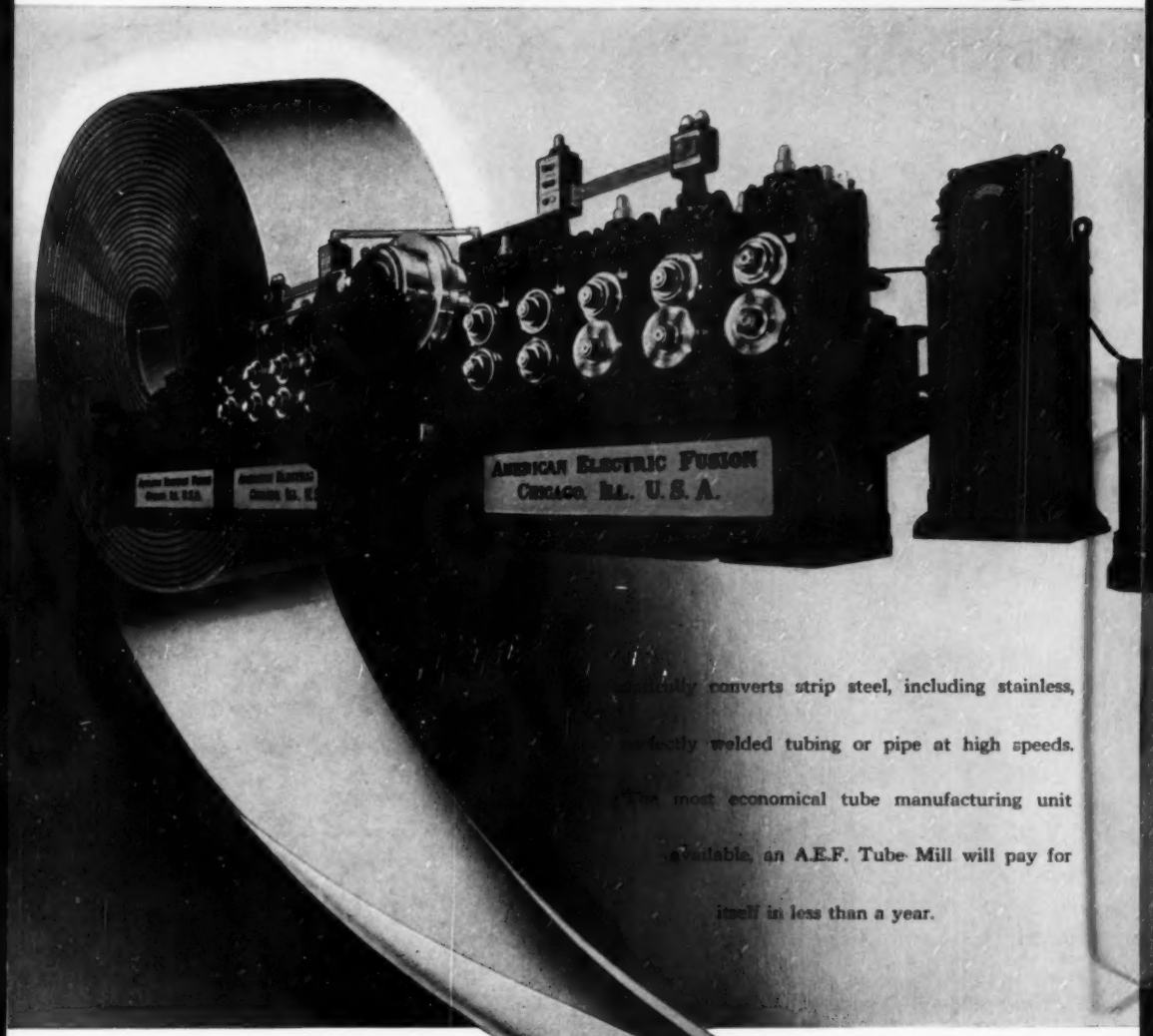

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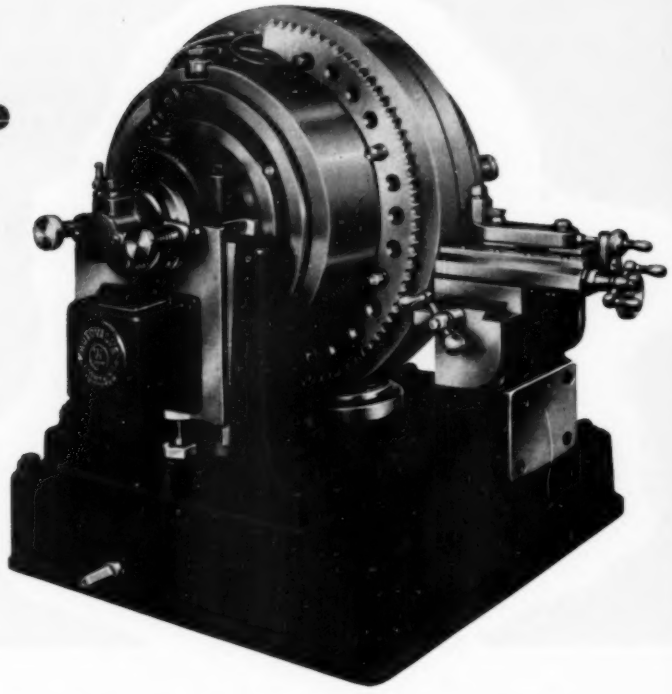

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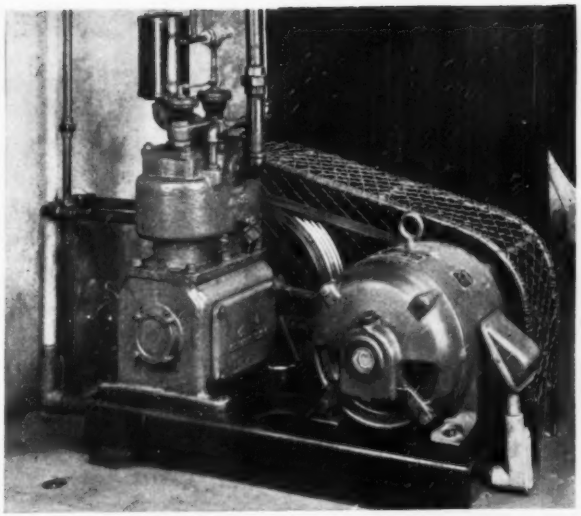

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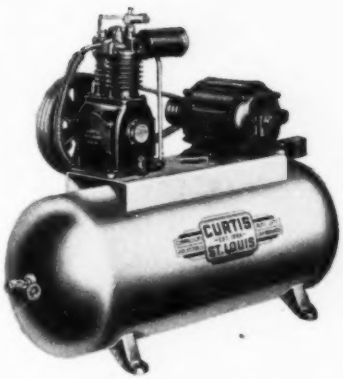

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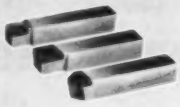

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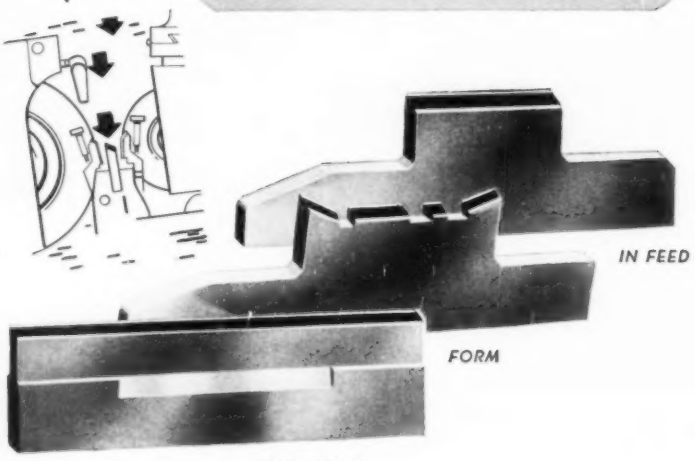

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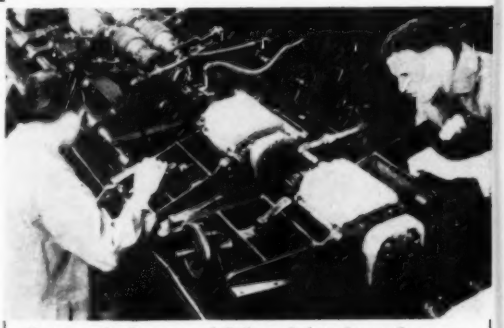

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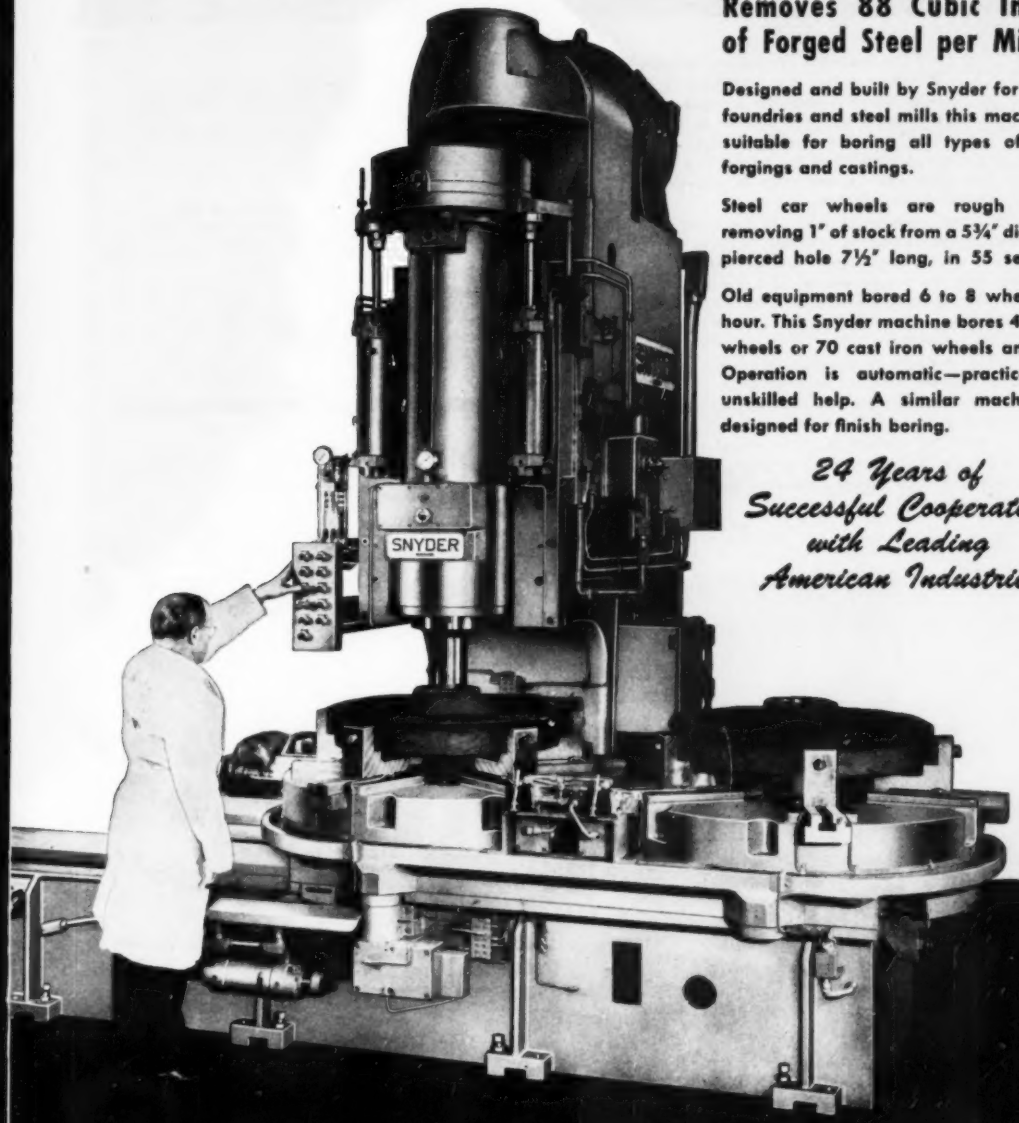

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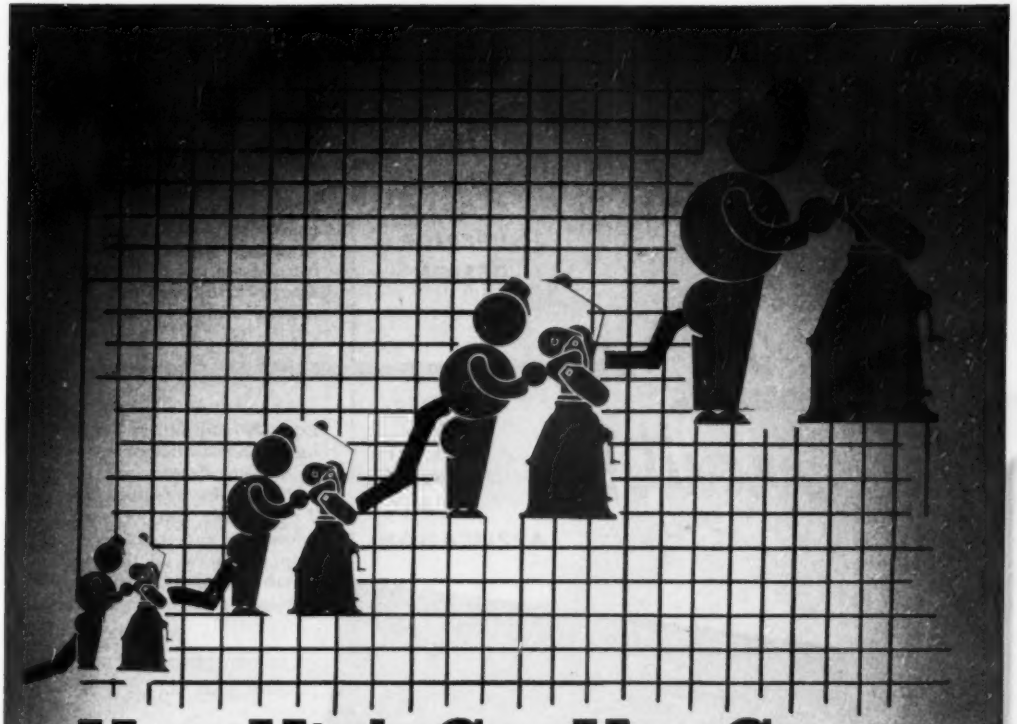

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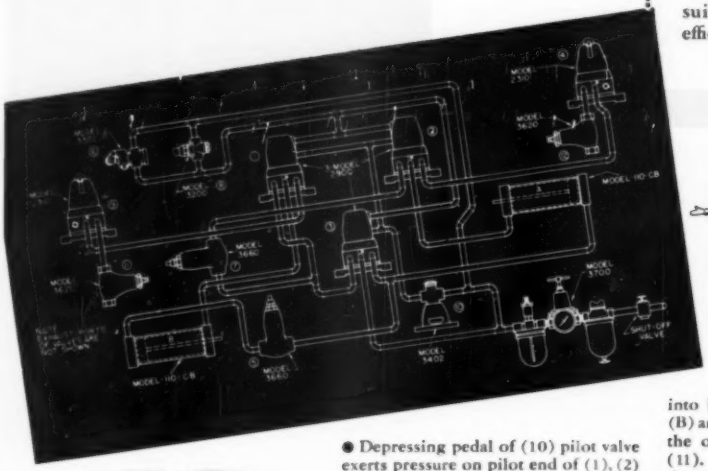

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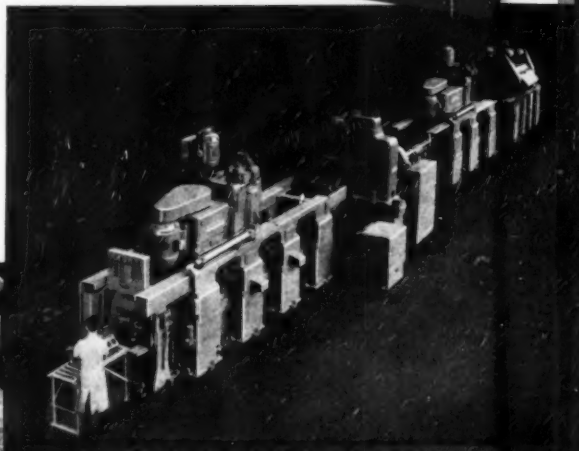
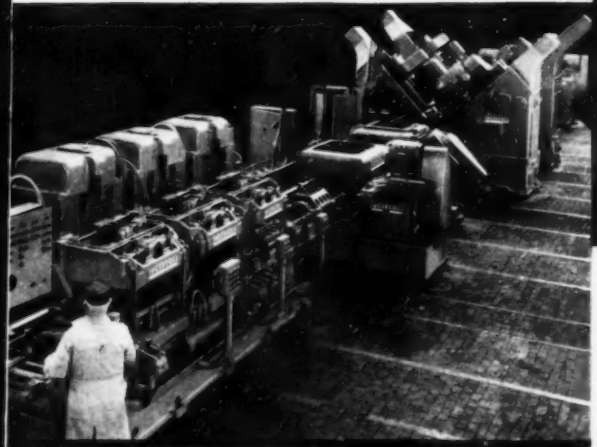
Get in touch with the nearest Vickers Application Engineering Office for information on how Vickers Hydraulics can improve your products.



Ingersoll 9-Station Process Machine has Vickers Hydraulic Controls to help secure extreme precision in cylinder blocks at lowest cost.



Ingersoll 11-Station Process Machine receives cylinder blocks from machine at right and similarly has Vickers Hydraulic Controls.

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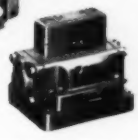
ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

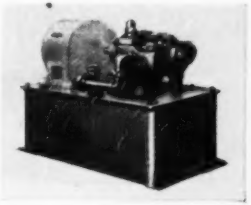
Representative VICKERS HYDRAULIC CONTROL UNITS USED ON INGERSOLL PROCESS MACHINES

Pressure Controls, Bulletin 45-34a

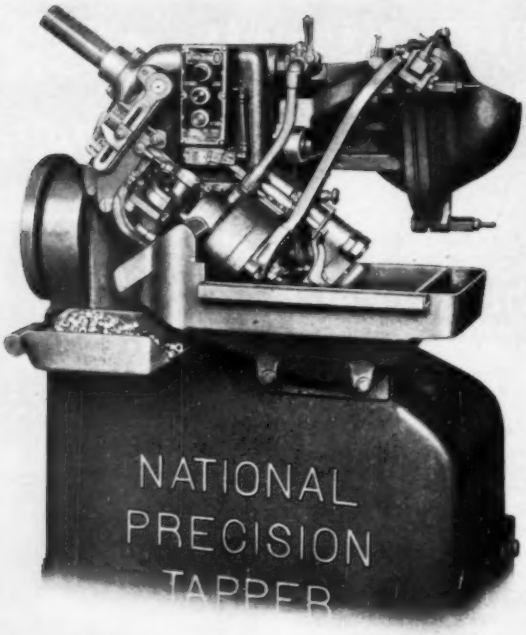
Flow Control Valve, Bulletin 45-35



4-Way Valve, Pilot Operated, Solenoid Controlled, Bulletin 48-27



Power Unit, Bulletin 46-43a



TAP NUTS TO ANY CLASS FIT AT NEW HIGH SPEEDS!

The many exclusive advantages of the new National High Speed Precision Nut Tapper, commonly used to tap Class III and IV fit precision threads, are now being further realized by using it to tap nut blanks of reasonable quality to the lower class fits!

Here are some of the advantages of this precision-engineered machine:

1. Higher production rates—made possible by new design features.
2. Longer tap life and more accurate threads resulting from the use of patented, non-reversing, free-floating, 180° hook tap.
3. Clean, chip free nuts, vital to power wrenching.
4. Quick and easy tap and tool changes.
5. Ease of operation due to greatly simplified design.
6. Protection from damage to taps and machine parts afforded by numerous new safety devices.

Why not investigate the possibilities of this High Speed Precision Nut Tapper?

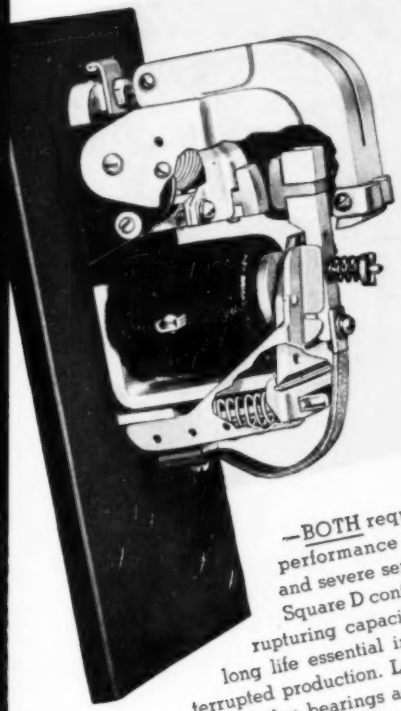
75th Anniversary 1874-1949

NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO.

DESIGNERS AND BUILDERS OF
MODERN FORGING MACHINES—MAXIPRESSES—COLD HEADERS—AND BOLT, NUT, RIVET AND WIRE NAIL MACHINERY

New York Detroit Chicago

Square D HEAVY DUTY D.C. Contactors are used on BOTH Mill Auxiliary and Accessory Machine Control Panels Because . . .



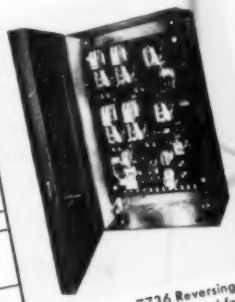
—BOTH require consistent performance under difficult and severe service conditions. Square D contactors have high rupturing capacity and unusually long life essential in providing uninterrupted production. Low inertia moving parts, knife edge bearings and strong blowouts contribute to fast operation necessary for both mill auxiliary and accessory machine control. Another important advantage—the problem of stocking spare parts is minimized through use of the same heavy duty construction.

Although identical contactors are used for both mill auxiliary and accessory machine control, the real difference in completed panels is governed by variations in assembly and construction features listed in the table below.

***Write* for information on Classes 7735, 7736, and 7950 Heavy Duty D. C. Control. Square D Company, 4041 N. Richards Street, Milwaukee 12, Wisconsin.**

FEATURES	MILL AUXILIARY CONTROLLERS	ACCESSORY MACHINE CONTROLLERS
Heavy duty contactors	X	X
Negative line contactor	X	
Accelerating contactors		X
—with blowout	X	Available
—without blowout	X	X
Heavy duty control relays	X	X
Heavy duty shunt field relays	X	
Pneumatic timers for acceleration		X
Overload relay	X	
2 THERMAL-MAGNETIC		X
1 melting alloy thermal trip	X	
Terminals		X
—mounted rear of panel	X	
—mounted front of panel	X	Available
Main line knife switch	X	X
Control knife switch	X	Available
Control circuit fuses	X	
Heavy gauge sheet steel enclosures	X	
Vault type door mechanism	X	
Enclosure removable back plate		

Class 7951 Reversing, Dynamic Braking Control for Mill Auxiliaries.



Class 7736 Reversing, Dynamic Braking Control for Accessory Machines.

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S. A., MEXICO CITY, D. F.

HOW NEW BRITAIN AUTOMATICS

Maintain Operating Accuracy

"The use of nickel alloy steels and irons in the construction of these new machines has resulted in an extremely rigid, powerful machine tool with both initial and permanent accuracy."

NEW BRITAIN MACHINE COMPANY

Output soars . . . and costs drop . . . when automatics maintain accuracy at the high machining speeds permitted by carbide tooling. But . . . only extremely rugged machines can utilize carbide-tipped tools to maximum advantage because they demand rigid, heavy mountings . . . steady feed at constant high speeds . . . no backlash in cams, followers, rollers, shafts or gears.

And these essentials can be assured by massive design incorporating nickel alloyed steels and irons, as exemplified by the new automatic screw machine, shown above, built by New Britain-Gridley Division, New Britain Machine Company, New Britain, Conn.

Some 244 parts are produced from nickel-molybdenum steels, heat treated to provide an optimum combination of strength, toughness and wear resistance. In addition, vital cast components are produced in nickel-molybdenum iron to assure good wear resistance and machinability.

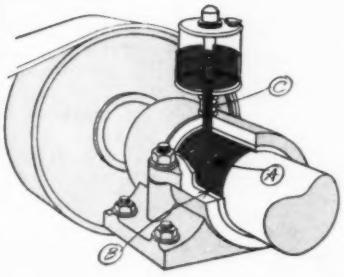
For dependable, trouble-free performance specify nickel alloys in *your* equipment. We invite inquiries regarding specific applications.

EMBLEM OF INCO SERVICE

Over the years, International Nickel has accumulated a fund of useful information on the properties, treatment, fabrication and performance of engineering alloy steels, stainless steels, cast irons, brasses, bronzes, nickel silver, cupro-nickel and other alloys containing nickel. This information is yours for the asking. Write for "List A" of available publications.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N.Y.

Case 1162—Keeping Oil on Heavy-Duty Bearing Surfaces



SHAFT BEARING

Adhesive Calol Vistac Oil reduced oil consumption and wear on bearings operated under constant heavy shock loads. Recommended for all plain bearings, table slides, air tools and enclosed industrial reduction gear sets. Comes in six grades: 9X, 14X, 19X, 28X, 36X, 45X — SAE 10 to SAE 50.

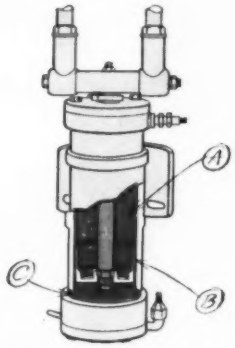
A. Extremely viscous and tacky and sticks tight under pounding — prevents metal-to-metal contact and reduces leakage waste.

B. Contains extreme pressure stringiness and oiliness additives . . . tough lubricating film remains intact in wide range of temperature conditions.

C. Small quantity provides adequate lubrication.

Calol Vistac Oil may be applied by forced feed, gravity, and sight-feed cup lubricators; the lighter grades by wick- and ring-oilers.

Case 1148A—Eliminating Deposits in Hydraulic Systems



MACHINE TOOL HYDRAULIC-FEED CYLINDER

Calol OC Turbine Oil, as the hydraulic medium in machine tool feeds, and lifts, will not deteriorate. In use as long as four years, it was only necessary to replace oil lost by leakage. Also recommended for steam turbines. Comes in four grades: 9, 11, 15, 19.

A. Contains very effective oxidation inhibitor — will not form deposits . . . same charge has been used in turbine as long as four years without trace of acidity.

B. High metal-wetting ability and corrosion inhibitor prevents rusting and pitting.

C. Separates readily from water or other contaminants — dirty oil may be reclaimed easily.

In turbines, the corrosion inhibitor in Calol OC Turbine Oil assures protection against rusting even during the critical initial operating period.

For additional information and the name of your nearest Distributor, write

STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street, San Francisco 20, California

The California Oil Company
Barber, New Jersey

The California Company
17th and Stout Streets, Denver 1, Colo.

Standard Oil Company of Texas
El Paso, Texas

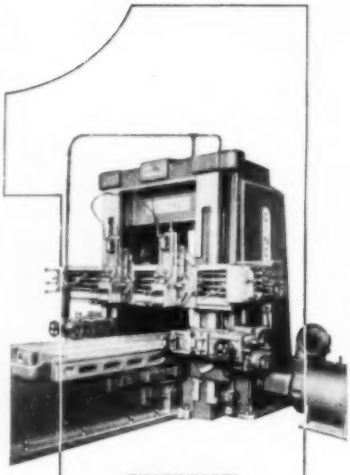
CALOL

Trademark Reg. U.S. Pat. Office

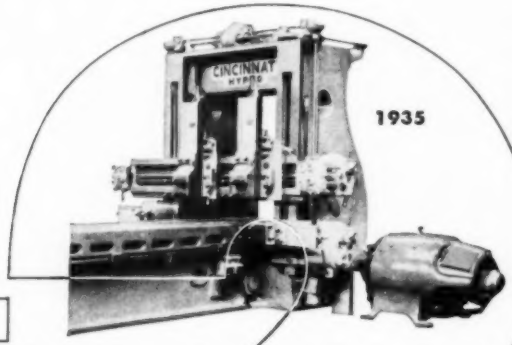
Do you want 100% more production?

According to a survey in 1945, 68.7% of the planers in use in the metal working industry were over 10 years old. 90% of the machine tools used today are obsolete. Has your plant one or more of these planers?

One 1949 Cincinnati Hypro will replace two or more planers built before 1935.

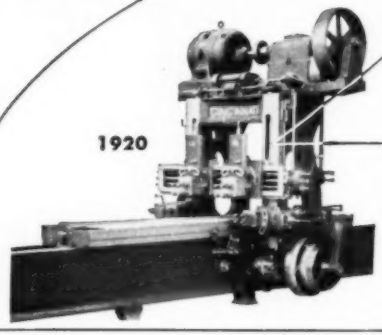


CINCINNATI
HYPRO
1949 Model



1935

1 equals in production 2 or more



1920

For complete information write for Bulletin 138

THE CINCINNATI HYPRO PLANER COMPANY

Subsidiary Giddings and Lewis Machine Tool Co., Fond du Lac, Wisconsin

PLANERS • BORING MILLS • PLANER TYPE MILLERS

CINCINNATI 9, OHIO

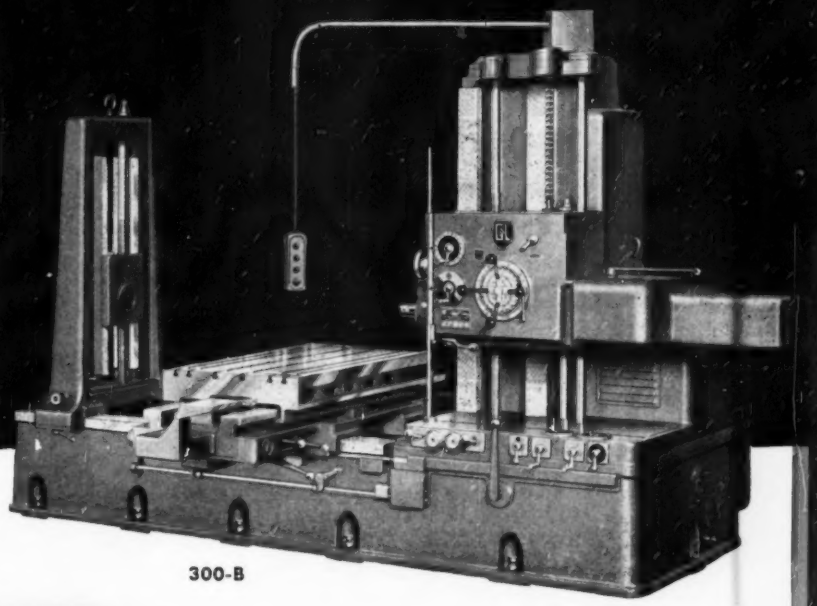
NEW

MEDIUM DUTY MACHINES FOR YOUR *HIGH SPEED* OPERATIONS

Of most recent design, the No. 300 Horizontal Boring, Drilling and Milling machine is made with either a built-in rotary or plain table. This machine is built for your high speed operations, and has the power and rigidity necessary to produce excellent finishes with great accuracy at high rates of speed and feed. A 10 HP AC motor drives the 3" spindle smoothly under the heaviest load.

Built-in scales and verniers give readings to .001" for headstock, table and saddle movements. A simple micrometer measuring attachment reading, with the use of standard measuring rods to .0001", may be provided if required.

G&L service engineers will gladly study the application of this machine, or any G&L, to your particular problem. Write for our six page bulletin describing the G&L 300-A, 300-B and 300-R.



300-B

300-R

SPINDLE DATA

Diameter	3.000"
Longitudinal Travel	24"
Number of Speeds	36
Speed Range (RPM)	22 to 1600
Number of Feeds	18
Feed Range (Inches per Rev.)	
Between 22 and 180 RPM	.002 to .125
Between 200 and 1600 RPM	.0012 to .062

MACHINE DATA

	300-A	300-B	300-R
Working surface of Table	24"x42"	30"x48"	30"x36"
Cross Travel of Table	30"	36"	36"
Max. Saddle movement on bed with End Support in place	30"	36"	36"
Max. dist. face of Spindle Sleeve to End Support	60"	72"	72"
Headstock Travel on Column	30"	36"	33"
Number of Milling Feeds		23	
Range of Milling Feeds to Headstock, Table and Saddle in inches per minute		1/16 to 30	
Motor Recommended		10 HP - 1750 RPM (Dyn. Bal. .001" NEMA)	

G&L

GIDDINGS & LEWIS Machine Tool Company

FOND DU LAC, WISCONSIN, U.S.A.

NEVER BEFORE

A SURFACE GRINDER LIKE THIS

The most important Surface Grinder development in years!

LEACH 6x12 SURFACE GRINDER

ONLY

$485.00

COMPLETE WITH MOTOR — F. O. B. PROVIDENCE, R. I., U. S. A.

Look at that low price, then consider these facts carefully: The Leach 6 x 12 Surface Grinder actually handles 90% — yes, 90% — of the work of larger, far more expensive machines. It's a completely self-contained unit with a 2-speed ball bearing spindle, driven by a ¾ HP motor. It's accurate, time-saving, vibrationless, and proved to the hilt by hundreds of enthusiastic owners. Write to us for detailed description.

H. LEACH MACHINERY CO.

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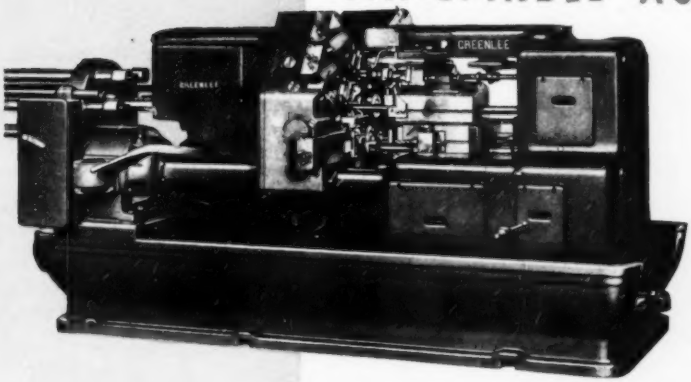
RUGGED, COMPACT, EFFICIENT

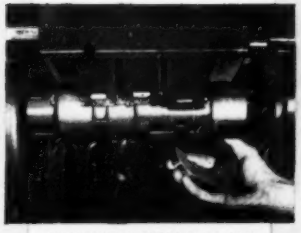
GREENLEE

SIX-SPINDLE AUTOMATICS



CUT COSTS *on all kinds of* JOB SHOP WORK

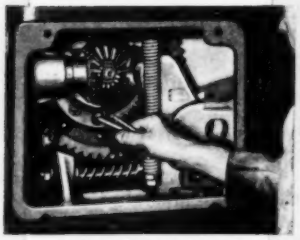
GREENLEE Automatic Screw Machines are rugged, compact, surprisingly simple in operation and maintenance, and unusually versatile. *Check these time-saving and cost-cutting features.*



CHANGING A CROSS SLIDE CAM

INTERCHANGEABLE CROSS SLIDE CAMMING

All six cross slide cams can be replaced in less than 6 minutes, and only 15 cams handle 90% of the average job-shop requirements.



SETTING TOOL SLIDE STROKE

STANDARDIZED TOOLING SPEEDS SET-UPS

With identically machined tool cavities and interchangeable tool holders, Greenlee Automatics make quick job changes a cinch. You save in equipment costs, too!

A SIMPLE ADJUSTMENT SETS THE STROKE

A graduated worm wheel permits an accurate setting of the tool slide stroke in a simple, easy operation without guesswork, fuss, or bother.

A ROOMY TOOLING AREA HELPS OPERATORS

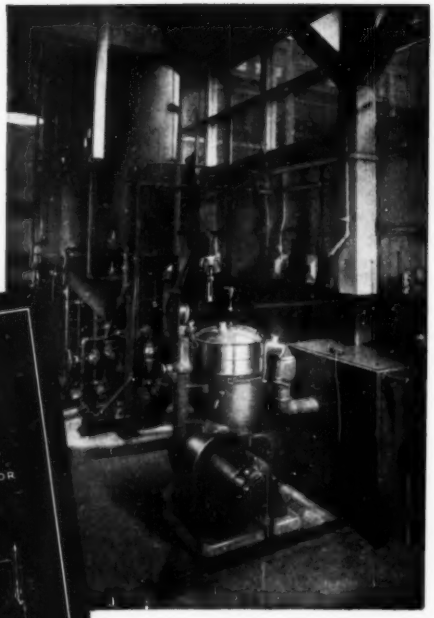
There's plenty of elbow room in the tooling area, making it easy for operators to accurately position tools and attachments for best results.

WRITE TODAY... and let us send you our 20-page book on Greenlee Automatics. Ask for Screw Machine literature.

GREENLEE BROS. & CO.
1723 MASON AVE., ROCKFORD, ILL.

DRILLING, BORING, TAPPING MACHINES • SCREW MACHINES • TRANSFER PROCESSING MACHINES

The Most Satisfactory Means of *Purifying* CUTTING OIL



Purification of cutting oil by De Laval Oil Purifiers is a profitable salvage and maintenance operation. By centrifugal force, these machines restore cutting oil to usable condition. In itself, this is an excellent means of saving money. But even more important than the oil economies effected are the production advantages of having plenty of cutting oil available, absolutely free of metallic impurities. These advantages include longer tool life, higher permissible cutting speeds and minimized wear on moving parts of cutting tools.

There are many other applications for De Laval centrifugal machines in most metal-working plants. For example, De Laval purification of hydraulic oils lengthens the life of the pumps used for maintaining the necessarily high pressures in the hydraulic cylinders, and minimizes danger of pilot mechanism sticking.

● *Write for Bulletin MM-1 and check the applications in your own plant.*

De Laval

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

PURIFIERS AND CLARIFIERS FOR FACTORY OILS

POP'S school of Filing

IT LOOKS LIKE JUGHEAD'S STAGE CAREER IS OVER! IF HE TURNS 'ROUND HE'LL KETCH A FILE IN HIS JUGGLER VEIN!
IF I C'N KETCH JUST ONE FILE I'LL BE SU'PRISED-- BECAUSE I WORK BETTER IN A SPOT-LIGHT!
JUGHEAD!! DROP THOSE NICHOLSON FILES!-ER-I MEAN HOLD ON TO 'EM-- OR YOU'RE GONNA BE IN A SPOT YOU WON'T LIKE!

"NO EXCUSE for file abuse" says Pop the foreman. On mass-production especially, the proper use and care of files enter heavily into savings in *man-hours*, *materials* and *new-file costs*. Here are some timely suggestions worth posting in tool-rooms, on shop bulletin boards, and over workbenches:

- Don't throw files among other tools or objects.
- Don't lay files on top of, or stack them against, one another. Keep them separate—either standing with tangs in holes, or hung on racks by their handles.
- Keep files in a dry place, so rust will not corrode their cutting edges.
- Keep files clean of filings. Tap file frequently on wood (not on metal) to loosen chips. Also brush with file brush or "card."
- Don't put too much pressure on the forward, or cutting, stroke.
- Never "drag" file back under needless pressure.
- Use *The right file for the job.*

The better the file the greater the reward of care. Nicholson and Black Diamond brands—*sold through industrial distributors*—are of the highest quality . . . made to serve long under normal circumstances, still longer under proper use and care.

• **HOW TO USE AND TAKE CARE OF FILES** *is elaborately covered in Nicholson's famous 48-page illustrated book,* "FILE FILOSOPHY." *How many copies for "key" uses shall we send you?* FREE.

NICHOLSON FILE CO. • 29 ACORN STREET, PROVIDENCE 1, RHODE ISLAND

(In Canada, Port Hope, Ont.)

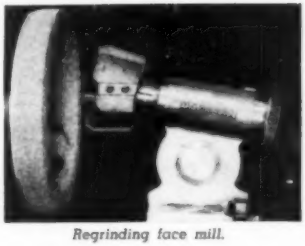
NICHOLSON FILES *FOR EVERY PURPOSE*

NEW MADISON Grinding Fixture gives you precision tool grinding at a *NEW* low price

$75.00
less arbors

Only $75.00 for this ruggedly built, soundly designed grinding fixture that handles the many tool grinding jobs with speed and precision. Now even the smallest shop can own one . . . and large shops can have several and avoid any delay in tool sharpening. Although the low price has been made possible by eliminating the expensive adjustments which are so rarely used, in actual practice the scope of this fixture is limited only by ability of the toolman to work out a setup.

The Madison fixture is graduated in all three planes and offers 180° automatic indexing for resharpening Madison cutters and which can be released for conventional handling of other types of tools.

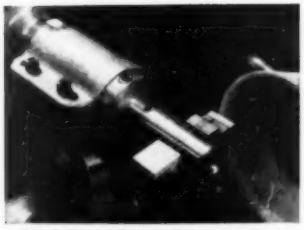


Regrinding face mill.

Grinding trailing angle and relief on tool bit.

Regrinding face of end mill.

Resharpening spiral milling cutter.



Regrinding relief angle on Madison reaming cutter.

Grinding lead angle on Madison roughing cutter.

ARBORS FOR MADISON FIXTURE are available for Jacobs chuck, for milling cutters, and for single bit tools, as well as the complete range of arbors for Madison tools, at $12 each. If needed, special arbors will be designed and built by Madison. Quotations upon request.

WRITE FOR this NEW color bulletin which describes the Madison fixture in detail.

MADISON ADJUSTABLE REAMING TOOLS

MADISON MANUFACTURING COMPANY
DEPT. AM **MUSKEGON, MICHIGAN**

You can
LOWER
DRILLING
COSTS

. . . with
SCULLY-JONES STYLE "B"
DRILL CHUCKS

SAVE
the difference
between the cost of taper-shank drills and straight-shank drills.

You can save 25% or more by replacing taper-shank with straight-shank drills and driving them with Scully-Jones Style "B" Drill Chucks. *You replace worn-out drills only*, as these chucks are built to outlast many drills.

Shop men like these simple, one-piece chucks, with no moving parts to get out of order; easy to insert or eject from any spindle, holder or attachment having a Morse Taper hole.

You get a positive drive when you use Scully-Jones Style "B" Drill Chucks as the milled flats on the shaft of the drill are engaged in the splined section of the chuck.

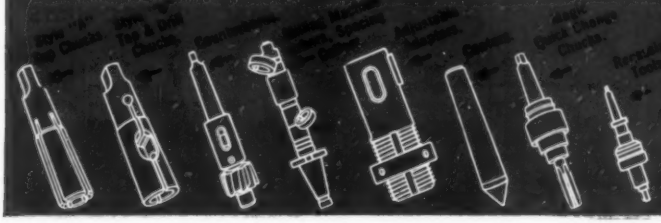
You reduce the number of rejects. Bore and shank of these chucks are ground concentric within .002", gauged at a distance equal to the projection of a standard drill from the chuck. This assures a true running tool.

You can use these chucks also for driving deburring tools, tapered pin reamers, straight shank countersinks, counterbores, chucking reamers, etc.

For complete specifications and prices see pages 42 through 48 of Scully-Jones Tool Engineering Manual 500 or Scully-Jones Slide-Type Selector No. 5 on Style "B" Drill Chucks.

You can get
IMMEDIATE
DELIVERY
from our stock of all popular sizes.

YOU GET LOW COST, FAST, ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS



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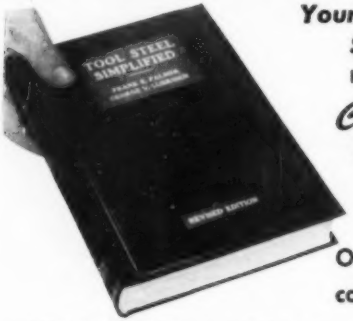
A 564-page authoritative handbook



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Part I—Getting Acquainted with Tool Steel

1. Tool Steel Terms
2. Tool Steel—What It Is
3. The Analysis of Tool Steel
4. The Character of Tool Steel
5. The Soundness of Tool Steel

Part II—Selecting the Right Tool Steel for Each Kind of Tool

6. The Matched Set Method
7. The Twelve Matched Tool Steels
8. The Matched Set Method in Use
9. The Tool Steel Selector

Part III—Properties, Heat Treatment and Testing of Tool Steel

10. Heat Treating Methods and Equipment
11. Hardness and Toughness Testing
12. Properties and Heat Treatment of Twelve Matched Tool Steels
13. High Speed and Hot Work Steels

Part IV—Things Worth Knowing

14. Relation of Design to Heat Treatment
15. The Hot Acid Etch Test
16. Timbre and Hardenability Tests
17. Spark Testing
18. Furnace Atmosphere
19. The Time Required to Heat Tool Steel
20. Quenching and Tempering
21. Trouble Shooting

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Please send me, postpaid, your revised "Tool Steel Simplified". I enclose $2.00 ($2.50 outside U.S.A.) in full payment of the book.

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KICK THE GREMLINS OUT OF PRECISION LAPPING

GET THIS VALUABLE TRIAL KIT ABSOLUTELY FREE!

PROVE THEM AT OUR EXPENSE!

The solution to your toughest tool room lapping problem probably lies in one of these 6 sample jars. Just try these *finer*, fine grit compounds at our expense. Kit mailed free anywhere in the United States. No obligation.

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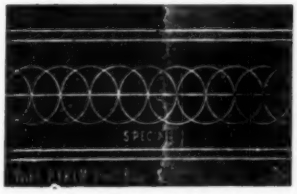
518 MELWOOD ST. USP PITTSBURGH, PA.

DYKEM STEEL BLUE

STOPS LOSSES

making dies & templates



Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information

THE DYKEM COMPANY, 2301 B North 11 St., St. Louis, Mo.
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MAKES QUALITY SCREW MACHINE PRODUCTS

It's no question . . . it's a fact!

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WHO is... Wm. H. Ottemiller Co. YORK, PA.

Write for name of nearest distributor and our free illustrated folder.

a blade like this

on a machine like this

boosted cutting speed 53%

There's good reason why a change to Atkins "Silver Steel" Powersaw Blades so frequently results in sensationally improved cutting performance.

The Atkins "Curled-Chip" Tooth form, with its inward curved face, actually *lifts* the chip free in a smooth, continuous curling motion. Tooth-dulling heat and power-wasting friction are reduced to a minimum. In addition, these blades are made of Atkins own special analysis "Silver Steel" — the steel that was developed to take an edge and hold it through record cutting periods and consistently heavier feeds.

Why not ask your industrial distributor to arrange a demonstration on your own machines and work?

See your Industrial Distributor First

CUTTING REPORT

Material: 6" dia. No. 94100 Steel (equivalent to Temkin No. 5100)
Cutting time with previous blade: 13 min.
Cutting time with Atkins blade: 8½ min.
Increase in cutting speed: 53%

ATKINS "*Silver Steel*" Hand Hacksaw Blades

The blade that takes the "hack" out of hacksawing. Fast-cutting, easy to work with. Made of "Silver Steel", with tough rugged teeth that hold up without breaking or dulling for many cuts through toughest metals. Ask for the blades with the "Blue Ends".

ATKINS "*Silver Steel*" SAWS

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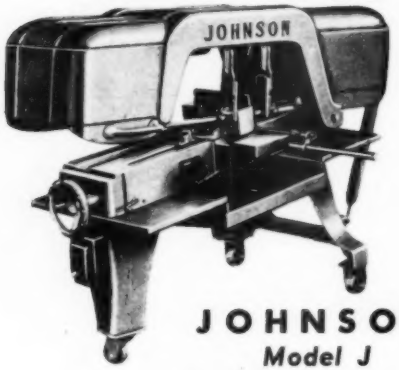
AAA ATKINS "ATKINS ALWAYS AHEAD"

MAKERS OF BETTER SAWS FOR EVERY CUTTING JOB

Write your own ticket . . . in metal cut-off capacity

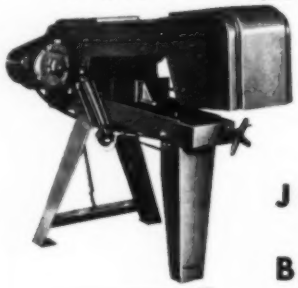
10" x 18"



JOHNSON
Model J
BAND SAW

Sturdy and fast, with the extra rigidity that permits higher speed operation without shortening blade life, and the extra accuracy that cuts square and true, saving machining time. Extra capacity too—10" rounds, 18" flats. It's everything you want in a band saw.

5" x 10"



JOHNSON
Model B
BAND SAW

A smaller, lighter, portable version of the Model J, with the same three-point-supported rigidity, and all the weight required for its capacity. All the accuracy and speed of the larger model. If you have metal cut-off work up to 5" rounds, 10" flats, this is the ideal tool for it.

CATALOGS for the asking Write

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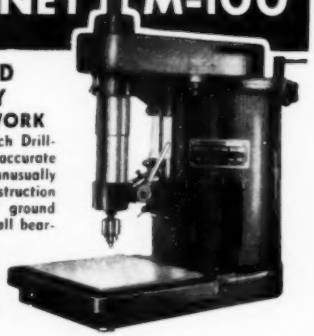
SIGOURNEY M-100



MAINTAINED ACCURACY IN PRECISION WORK

The Sigourney M-100 Bench Drilling Machine is extremely accurate on precision jobs. It is unusually sturdy and rigid in construction . . . has hardened and ground spindles . . . and sealed ball bearings throughout. All moving parts are entirely closed for maximum operator safety. M-100 is built for long and steady service.

This sturdily constructed bench drilling machine is available in 1, 2, 3, and 4 spindle models . . . speeds from 4,000 to 10,000 r.p.m.

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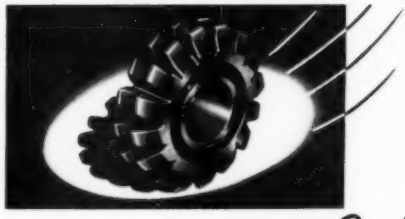
Division Niles-Bement-Pond Co. . . . West Hartford, Connecticut



Reduce Tooling Costs Increase Production
WITH SENTRY HARDENING

Full hardness and maximum toughness result when your high speed steel tools are hardened in Sentry Electric Furnaces using Sentry Diamond Blocks. Unusual contours and sharp corners are faithfully retained.

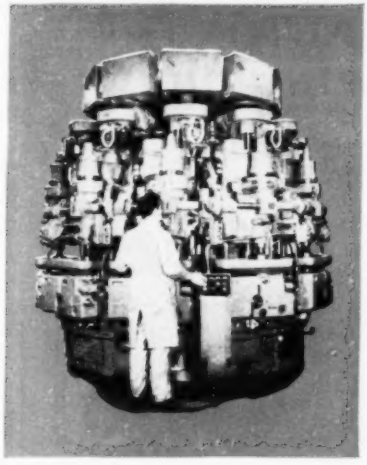
With Sentry Diamond Blocks a neutral atmosphere is maintained — no oxidation, no scaling, no reduction in size. Tools may be thoroughly soaked for maximum hardness without danger of burning. High resistance to breakage and longer tool life result in higher production and lower tooling costs.

Sentry Furnaces are fast, clean and economical to operate. They pay for themselves within a short time.

Write for full information. Ask for recent bulletin 1054-F13

Sentry Model SY Electric Furnace

The Sentry Company
FOXBORO, MASS., U.S.A.

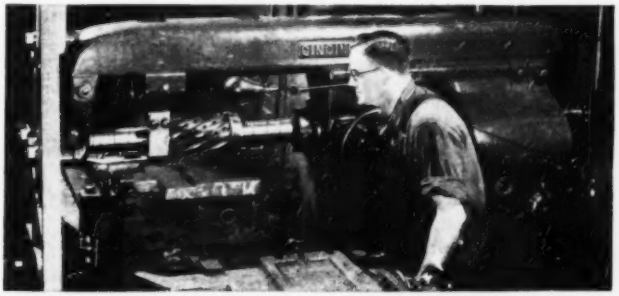


"One costly shutdown after another dogged our machine shop operations until we finally learned the reason. Our circulating oils were foaming and oxidizing which caused sludge formation and critical corrosion damage to our equipment.

"A Cities Service Lubrication Engineer suggested a change in the circulating oils. We tried a Cities Service Pacemaker 'T' oil. These multi-purpose oils are fortified against foaming, oxidation and rust.

"Results were immediate. Costly shut-downs were reduced by over 200%. Efficiency of the whole line improved and quality of production was substantially stepped up."

Free—If you use cutting oils, write for our booklet "Metal Cutting Fluids." Write Cities Service Oil Company, Room 331 Sixty Wall Tower, New York 5, N. Y.



CITIES SERVICE PACEMAKER "T" MULTI-PURPOSE OILS

★ For Hydraulic systems ★ T... Air Compressors ★ Other circulating systems

CITIES SERVICE

FOR EXTREME ACCURACY AND FASTER PRODUCTION

Use the New BLACK Drilling Unit

● Black Drilling Units, designed to operate in any position, employ an entirely new principle. A patented traversing motor shaft is the work spindle. Because spindle and motor rotor are integral, torque is applied evenly around the spindle. Air feed provides rapid shockless advance to the work. Hydraulic control from this point provides uniform drill feed, even when breaking through. Oversized bearings insure long life. Jacobs chucks are standard, but No. 2 female Morse taper can also be supplied.

Micrometer stop insures depth accuracy to .001". Calibrated stop control makes adjustment easy. Interlocking and auxiliary controls are easily installed.

Sizes from ¼ to 1 HP have the same base-to-center-of-spindle dimension for interchangeability. Speeds from 840 to 3450. Voltages 209 to 550, 3 ph., 60 cycles. Sizes to 10 HP can also be supplied. Units are adaptable to any operation requiring a combination of rotating and traversing motions.

Write for detailed information.

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Handles a wide variety of toolroom jobs with speed, accuracy, efficiency . . . die work, jig and model making, drilling, reaming, milling. Releases larger machines for work better suited to their capacities. Easy set-up, quick changeover . . . velvet-smooth feed, eight spindle speeds from 275 to 4250 rpm. . . simple, direct micrometer setting.

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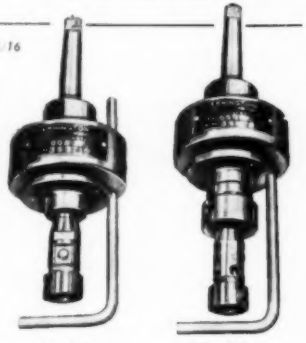
TAPPING CHUCKS

All Sizes in Stock for Immediate Delivery

Capacity No. 10 to 5/16

- Both chucks are equipped with Jacobs Rubber Flex Tap Chucks
- Rigid, Sensitive, Quick - reverse, with self-centering, double grip Tap Holder
- Supplied with No. 1, No. 2, No. 3 M. T., No. 2 or No. 33 Jacobs Socket Shanks

Other Sizes up to 2" Write for Bulletins on Auto - opening Die Heads, Clutch Tappers to 2" tap, Cone Tappers to 3/16" in steel—1/4" in cast iron.



No. 00B Positive **$40**

No. 00C Friction **$45**

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These Steel-Weld Fabricated heavy machine parts are typical of work turned out in the Mahon plant for many customers representative of a cross section of heavy industry in the United States. You also, will find the Mahon Company an excellent source for welded Steel in any form . . . a source equipped to provide complete machining service on any welded steel products or parts. Mahon's staff of design engineering experts, backed by craftsmen highly skilled in the latest techniques in the welding art, are your assurance of a better, smoother appearing job embodying every advantage of Steel-Weld Fabrication.

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Engineers and Fabricators of Welded Steel Machine Bases and Frames, and Many Other Welded Steel Products

MAHON

COMPLETELY **NEW**
CASE HARDENING PROCESS

Carburit

ULTRA RAPID PACK HARDENING PASTE

HIGH RAPIDITY OF PENETRATION
.040" in 25 to 30 Minutes

SOLVES PROBLEM OF SELECTIVE HARDENING
by applying only to desired sections

NO SPECIAL FURNACES OR EQUIPMENT NEEDED
—even an open fire will suffice

ENORMOUS TIME SAVING
—repair units can be hardened right in maintenance shop. No special training required

CARBURIT IS NON-TOXIC

Isopac

ISOLATING PASTE

KEEPS DESIRED SECTIONS SOFT

While rest of workpiece is being hardened

REPLACES COPPER PLATING—
and other expensive methods.

JUST PUT ON AND KNOCK OFF
Saves time, money.

PREVENTS PENETRATION OF CARBON AND SLOWS DOWN COOLING OF COVERED SECTION.

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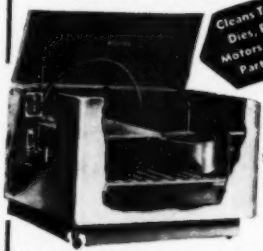
EVERY MODERN FACTORY NEEDS THIS FAST, EFFICIENT COLD PARTS CLEANING SYSTEM



$62.50 to $295.00 4 Models

AGITOR PARTS CLEANING SYSTEMS
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"What's so good about H-VW-M low-voltage GENERATORS?"

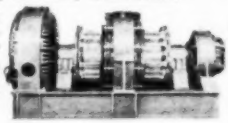
P. R. LYONS • District Manager • H-VW-M Cleveland Office

A customer fired that question at me the other day when we were talking electroplating and polishing equipment, and it was right down my alley.

"Man, take a look at these features," I replied, with all the enthusiasm first hand knowledge of H-VW-M low-voltage generator performance can arouse. "Fan action of commutator risers increases ventilation of field and rotor coils! Rolled steel ring, set in frame, lowers center of gravity! Liberal-size, sleeve type bearings assure long, quiet, trouble-free life! Moulded-in 'equaload' shunts distribute brush load equally, reduce resistance! Copper graphite brushes provide optimum commutator efficiency! Fully insulated brush holders eliminate current passage through springs and fingers! Copper pig tail bar lowers resistance of circuit.

"Add these features to H-VW-M's more than 70 years' experience with all low-voltage electrolytic applications—and I think you'll agree that H-VW-M motor generator sets are worth looking into for efficient, low cost power production," I concluded.

Ask your H-VW-M representative, or write "Headquarters,"* for Bulletin G-102, our new compact catalog of generator information.



* Hanson-Van Winkle-Munning has supplied the plating industry for over 70 years. Our sales-engineers are thoroughly familiar with every step in the process of electroplating and polishing. It is this overall knowledge that has made H-VW-M "Headquarters" for electroplating and polishing equipment, supplies and technical assistance.

SINCE 1820

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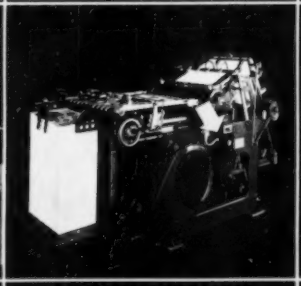
. . . Good for Millions of Trouble-Free Operations

VERSATILE . . . that one word best describes the wide utility of the Allen-Bradley Bulletin 709 Solenoid Starter. Most motor installations need across-the-line starting . . . push-button control . . . and dependable overload protection. These features . . . and many more . . . are provided by all Bulletin 709 Solenoid Starters.

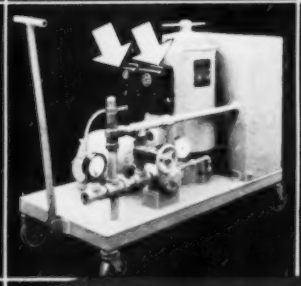
TROUBLE-FREE . . . that one word sums up the year-after-year service of Bulletin 709 Solenoid Starters. Only one moving part . . . hence no tricky gadgets to corrode, stick, or break. No contact maintenance. Install the Bulletin 709 Starter and forget it. It's good for millions of trouble-free operations.

for MOBILE MOTORS

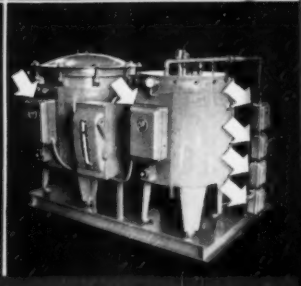
for PRINTING MACHINERY



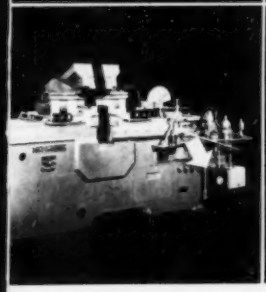
for PAINT SPRAYERS



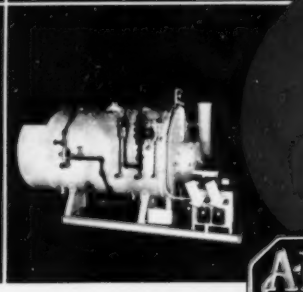
for OIL CONDITIONERS



for FLASH WELDERS



for STEAM GENERATORS



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MOTOR CONTROL

A-B Quality

Allen-Bradley Co.
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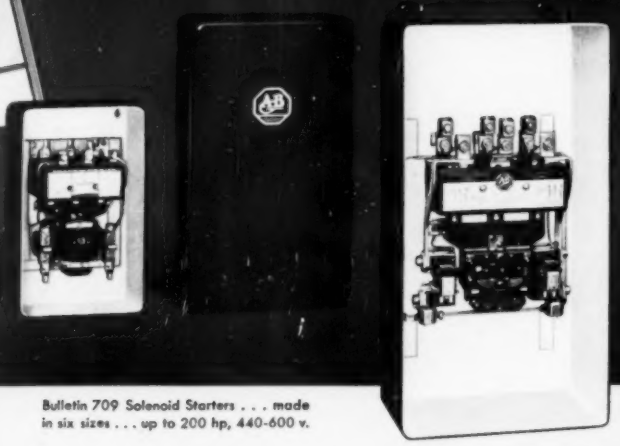
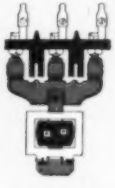
ALLEN-BRADLEY CONTROLS



Bulletin 709 Solenoid Starters . . . made in six sizes . . . up to 200 hp, 440-600 v.

Only ONE Moving Part

The 3 moving contacts, crossbar, and solenoid plunger (shown in red) form a single unit, which moves UP and DOWN in the solenoid coil with a simple, straight-line motion.



The 3 double-break, stationary contacts in the arc hood, to main line and motor, are "bridged" or closed by the moving contacts when the solenoid plunger is UP as shown above.

This compact Allen-Bradley catalog is a quick-and-easy reference manual on the performance, dimensions, and prices of starters, contactors, relays, push buttons, limit switches, etc., that exactly fit your needs.

Allen-Bradley solenoid motor controls are preferred by leading machinery manufacturers. Why? Because the simple design . . . ONLY ONE MOVING PART . . . means no pins, pivots, hinges, bearings, or other troublemaking parts. And their double-break, silver-alloy contacts need no maintenance. Write for catalog, today.

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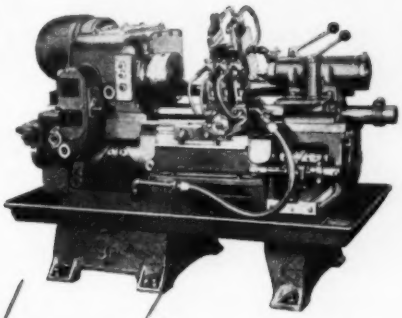
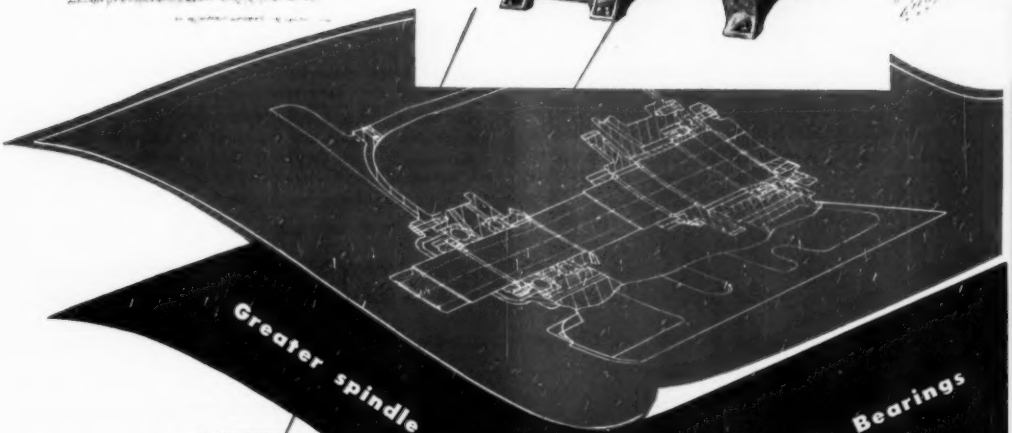
General Purpose | Dust-tight | Water-tight | Hazardous Dust | Hazardous Gas | Non-Haz. Cor. Gas | Haz. Corrosive Gas

A-B Quality

ALLEN-BRADLEY
SOLENOID STARTERS
QUALITY





Greater spindle rigidity with SKF Spindle Bearings

A couple ten-thousandths play . . . radial or end . . . can be the difference between "Reject" and "OK". That's why Jones & Lamson wanted a spindle design that was as rigid as possible.

Here's how SKF engineers designed the spindle: A double row cylindrical roller bearing at the spindle nose—for maximum radial rigidity. A thrust bearing opposed by a radial ball bearing at the rear—giving axial rigidity

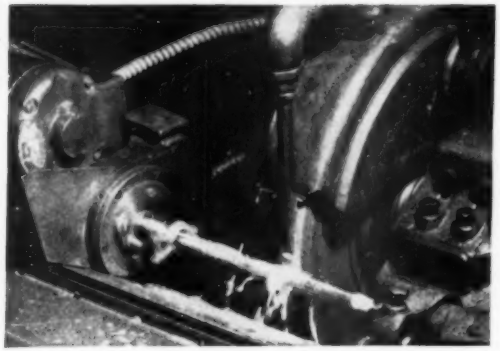
9 QUALITY POINTS OF SKF SPINDLE BEARINGS

- **Maintained spindle accuracy.**
- **Radial and axial loads absorbed by separate bearings resulting in maximum radial and axial rigidity.**
- **Rigid support of inner ring—eliminating creep.**
- **Press fit in housing supports outer ring.**
- **Positive control of internal radial clearance.**
- **Lapped rollers of "Gauge Makers" accuracy.**
- **No bearing adjustments required for a wide range of speeds, feeds and depths of cuts.**
- **Minimum "camming" action.**
- **Low friction—low operating temperature.**

Also manufacturers of quality	**Ball and Roller Bearings** **Pillow Blocks** **Rod Seal Bearings** **Balls**

An SKF Spindle Design engineer can help you with your machine tool bearing problems. Give him a call, or write: SKF Industries, Inc., Philadelphia 32, Pa. 6608

MACHINE TOOL BEARINGS ENGINEERED BY SKF



The Monthly Robertson Bulletin

CYLINDRICAL GRINDING IN THE TOOL ROOM

THE LARGE VARIETY OF WORK to be ground in tool rooms—and the many types of metal used—demand a universal free-cutting wheel that will remove stock fast and give the desired high finish. Such a wheel is the Robertson "Cool-Cut." Its revolutionary "open" structure permits cool cutting even on the hardest metals, with finishes well above production standards.

Plug gages, punches, reamers and many other tools can be successfully ground on the cylindrical grinder with the use of a Robertson RA605-KV wheel. Increases in production between grinds have run from 70 percent to as high as 400 percent. Several manufacturers report that it is the best all-round wheel they have ever used.

For faster and more accurate tool-grinding—for any grinding job, big or small, and especially the tough ones—specify Robertson. Whether they're vitrified or resin-bonded, Robertson Grinding Wheels enable you to buy production time.

ROBERTSON COOL-CUT

ROBERTSON MANUFACTURING COMPANY
TRENTON 5, NEW JERSEY

RESIN-BONDED AND VITRIFIED-BONDED GRINDING WHEELS • MOUNTED WHEELS • SEGMENTS

Here's the Answer to Binding, Breakage, Chatter, Stripped Threads, Dangerous Strains, Loosening, Leakage and Squeaks.
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TORQUE WRENCH
—HEAR—FEEL—SEE—

All these common faults are minimized or eliminated by modern product *quality control*—STURTEVANT torquing at critical points. STURTEVANT TORQUE Wrenches are *permanently accurate*. Because of their inherent design they cannot become inaccurate. Capacities from 0-8 in. oz. to 0-7200 in. lbs. Both inspection and high speed production types.

Write for Bulletin BW 5.

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Federal

FIRST IN RESISTANCE WELDING

BENCH WELDERS

Federal Series

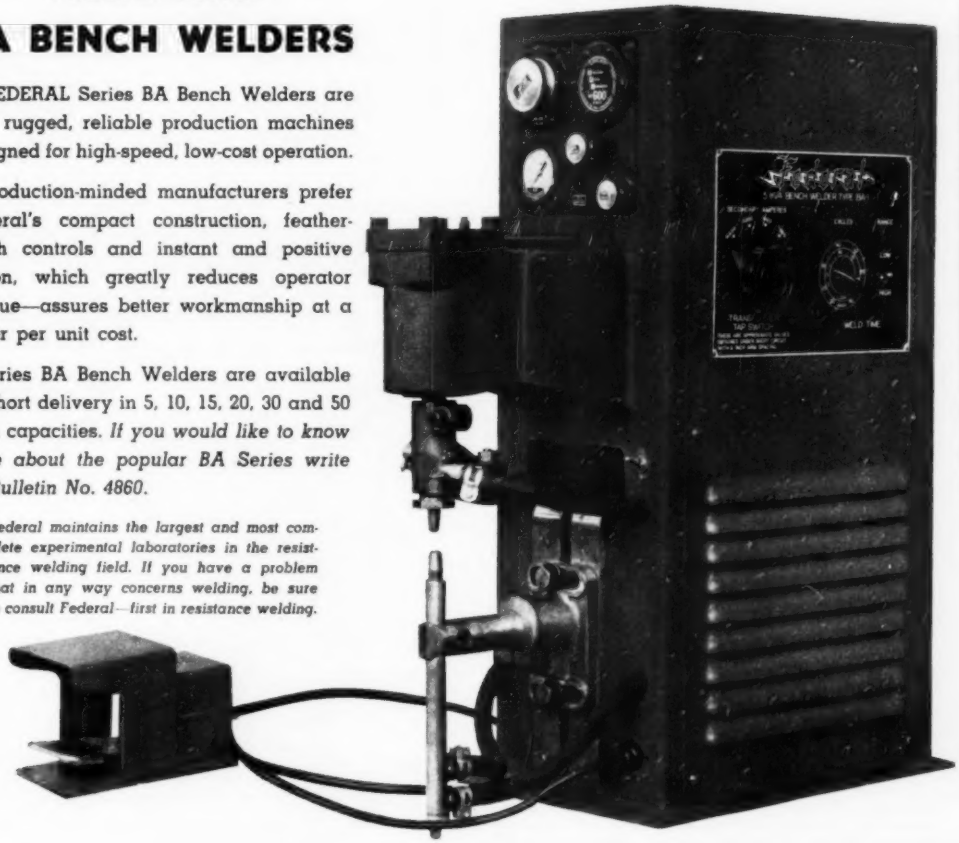
BA BENCH WELDERS

FEDERAL Series BA Bench Welders are rugged, reliable production machines designed for high-speed, low-cost operation.

Production-minded manufacturers prefer Federal's compact construction, feather-touch controls and instant and positive action, which greatly reduces operator fatigue—assures better workmanship at a lower per unit cost.

Series BA Bench Welders are available on short delivery in 5, 10, 15, 20, 30 and 50 KVA capacities. *If you would like to know more about the popular BA Series write for Bulletin No. 4860.*

Federal maintains the largest and most complete experimental laboratories in the resistance welding field. If you have a problem that in any way concerns welding, be sure to consult Federal—first in resistance welding.



Resistance Welders For Every Application • Presses From 50-Ton OBI To 2000-Ton Double Action

Federal WELDERS

THE FEDERAL MACHINE AND WELDER COMPANY

Dept. 139 Warren, Ohio • • Offices in Principal Cities

Warco PRESSES

ROTO-MATICS

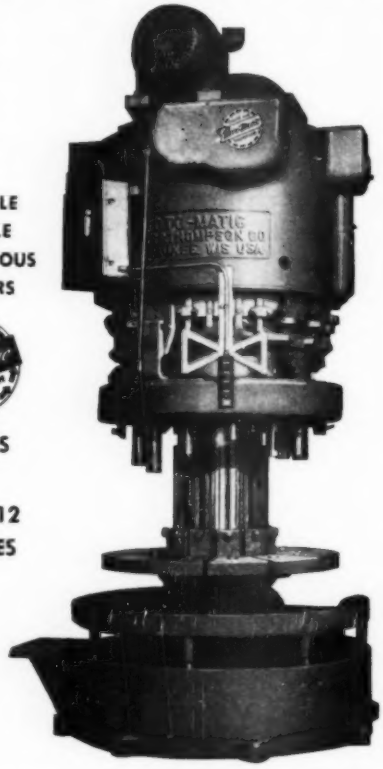
VERTICAL

MULTIPLE SPINDLE CONTINUOUS DRILLERS

DAVIS and THOMPSON Roto-Matic

3 SIZES

6-8 OR 12 SPINDLES



One Vertical ROTO-MATIC will equal the production of a whole battery of single spindle drillers with a proportionate reduction in labor and maintenance costs.

Where production demands fall below the capacity of the machine, on a single part, interchangeable fixtures can be designed for a variety of jobs. Where two operations are required on a single piece, requiring the same feeds and speeds, spindles can be arranged to give you the proper ratio of production.

2 SPINDLE DRILL HEADS

BALANCING OPERATION

AUTOMATIC CLAMPING

Engineering skill and thirty years of development have given us the necessary background to tool up these machines for the maximum in efficiency and accuracy of work, whether it be drilling, milling, boring, reaming, spot facing or chamfering.

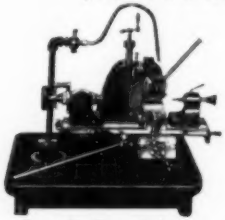
WRITE FOR BULLETIN 101.

DAVIS and THOMPSON CO.

MANUFACTURERS OF *Machine Tools*

MILWAUKEE 14, WISCONSIN

Derbyshire Micromill



Small Precision Milling Machine and Grinder

VERTICAL MICROMETER FEED	1.73"
VERTICAL LEVER FEED	.984"
CROSS FEED OF TABLE	1.26"
LONGITUDINAL FEED	3.15"
MAXIMUM DISTANCE SPINDLE TO TABLE	2.95"
ALL SCREW FEEDS WITH MICROMETER ADJUSTMENT TO	.001"

F. W. DERBYSHIRE, INC.

Waltham 54, Massachusetts

KEYSEATING

The Modern Way

Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1¼" in width.

Great simplicity and ease of operation of Davis Keyseaters assure the user of accurate, time saving work.

Let our engineer study your keyseating problems.

DAVIS KEYSEATER COMPANY

403 EXCHANGE ST. ROCHESTER, N. Y.

Presenting

THE NEW LUFKIN "CHROME CLAD" MICROMETER—with Non-Glare Satin Finish

Lufkin adds another important feature to the many which now distinguish its famous Micrometers,—"Chrome Clad", Non-Glare Satin Finish. Utilizing recent pacesetting developments in metal finishing, Lufkin now applies a heavy chrome plating to its micrometers. This finish *possesses a non-glare quality which makes reading easier than ever before.* You get your reading at a glance in bright or poor light. Markings stand out sharp and bold against the satin finish. It is rust and wear resistant. Here's a real ally for the precision worker to whom accuracy is a "must". Ask your dealer to show you the seven superior features of this improved precision tool.

7 SUPERIOR FEATURES

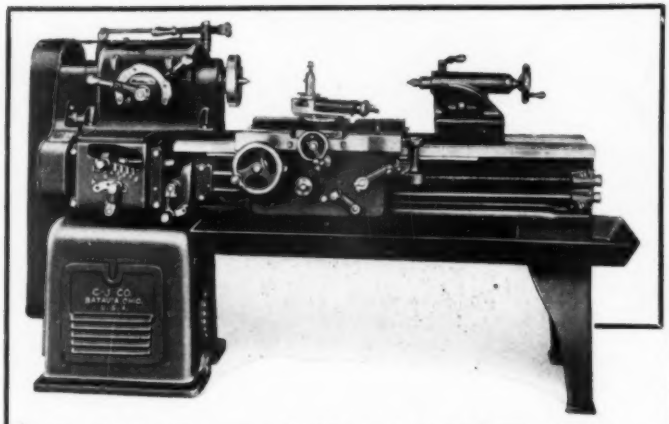
***"Chrome Clad", Non-Glare Satin Finish, Easy to Read, Rust and Wear Resistant • Hardened Ground Thread • Easy Adjustment • One Piece Spindle • Cutaway Frame • "Rapid Reading", (Each Thousandth Numbered) • Micro-Lapped Mirror-Like Finish on Anvil and Spindle Ends.**

*Before releasing Lufkin Chrome Clad Micrometers to the public they were used for several years in our own plant on various types of rough and finished metal working production. All micrometers tested have retained their non-glare satin finish to our complete satisfaction.

PRECISION TOOLS LUFKIN TAPES • RULES

Accuracy of Measurement is the Key to Precision

THE LUFKIN RULE COMPANY • SAGINAW, MICHIGAN



C. & J. Geared Head LATHE

16 INCH
12 SPEED

● Designed for high quality general service. Built in one size and one model only. Powerful, accurate, tooled and equipped to produce efficiently. Features exceptionally long carriage bearing (23⅜"). Feed is provided by separate rod, so lead screw is used only for thread chasing. Complete regular equipment includes thread indicator. Guaranteed accurate within .001 inch in 14 inches. *Write for new descriptive bulletin 38-A-8.*

CARROLL & JAMIESON MACHINE TOOL CO.
BATAVIA, OHIO

Small Investment Does a BIG JOB

Why cut off metals on big, high priced equipment? This low cost band saw does the same jobs with time and labor saving speed and accuracy. Capacity 8" x 16". Coolant Model (illustrated) permits continuous production. Cuts round, square or odd shapes, single or in gangs.

Used in thousands of modern plants. See your dealer or ask for bulletin.

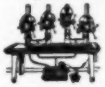
KALAMAZOO Metal Cutting BAND SAW

MACHINE TOOL DIVISION
KALAMAZOO TANK & SILO CO., Kalamazoo 16, Michigan
Exclusive Export Distributor
American Steel Export Co., New York City

GRAY-MILLS

PORTABLE
PUMP UNITS

Use these compact self-contained units as...



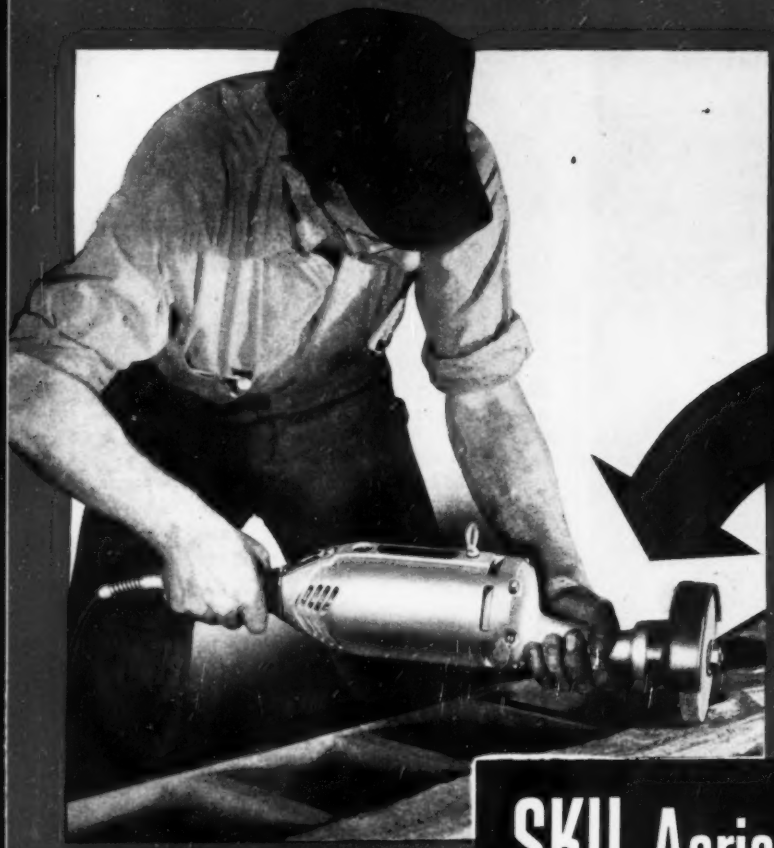
Coolant Systems for all types of machine tools. Stand-by pump units, and for special application on original equipment.

20 models. 1/25 to ½ HP.
Gear or centrifugal.

See your Industrial Distributor or send for catalog to

GRAYMILLS CORPORATION
2001 Ridge Ave. Evanston, Ill.

BUY U.S. SECURITY BONDS NOW!



Bring a world of POWER to tough grinding jobs . . . get

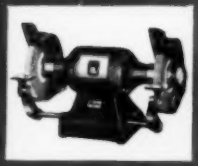
SKIL Aerial Grinders

And for your other surfacing jobs . . . more fast-working SKIL Tools

SKIL Disc Sanders
All-purpose tools for fastest sanding, grinding and wire brushing. Ideal with cup wheels, wire brushes and sand paper discs. 3 powerful models.

SKIL Belt Sanders
Speed all surfacing on flat or contoured areas of wood, steel and compositions. Belt widths from 2¼ to 4½ inches. 4 powerful models.

SKIL Bench Grinders
A complete line of powerful, fast-working grinders to boost production grinding, sharpening, wire brushing and buffing. 4 powerful models.



Speed up slow grinding jobs with SKIL Aerial Grinders. Their extra power grinds down weld beads faster . . . removes rust, scale, fins and burrs *in less time* . . . saves minutes on all buffing and polishing operations.

And SKIL Aerial Grinders bring you big savings longer . . . because these handy, hardworking tools are built with finest gears and bearings . . . smoothest-running motors . . . highest quality parts and housings. They really stand the gaff on all production, maintenance and repair jobs. Call your SKIL Tool Distributor for a demonstration today. You'll be glad you did!

SKIL ELECTRIC Tools PNEUMATIC

TRADE-MARK

SKILSAW, INC.
5033 Elston Ave., Chicago 30, Ill.
Factory Branches in Principal Cities
In Canada SKILTOOLS LTD.
66 Portland St., Toronto, Ont.

YESTERDAY'S PIONEER . . . TODAY'S LEADER

WELDON

MEASURING ATTACHMENT for Lathes

(Direct Reading)

Saves Time • Reduces Waste

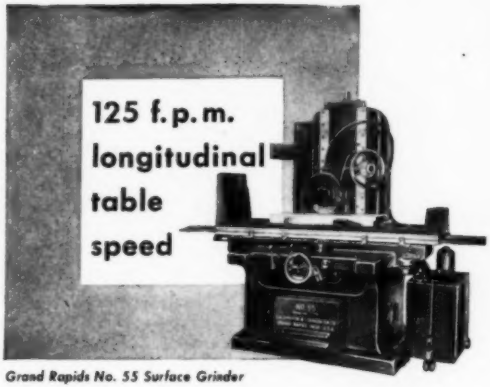
• This handy Weldon attachment measures directly the forward or reverse movement of the lathe carriage, within .001 of an inch. Easily attached to most lathes by drilling and tapping of one hole. • Dependable, accurate, convenient . . . saves time and reduces work spoilage.

. . . . . .

Write for Circular LA-1

THE WELDON TOOL CO. *Cleveland 4, Ohio*

3000 WOODHILL ROAD



Grand Rapids No. 55 Surface Grinder

Faster precision production is possible with the exceptional table speed of Grand Rapids Hydraulic Feed Surface Grinders. Both longitudinal table travel and cross feed are automatic, hydraulic. Wheel head is powered for rapid vertical travel.

Write for Bulletin GL-101

GALLMEYER & LIVINGSTON COMPANY

Manufacturers of Grand Rapids Grinders

330 STRAIGHT ST., S. W., GRAND RAPIDS 4, MICH.

No more need for costly lapping. Instead, use this inexpensive method of honing to exact size. Abrasive element removes stock, corrects ovality or taper, produces micro-inch quality finish. Accurate size on any material from turned or ground surface. Very simple, fool-proof, trouble-free design; no specialized skill or lengthy training required (just move the hone back and forth over the revolving surface). Four sets cover range from 1/16" to 1" diameter.

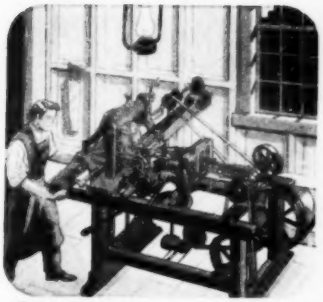
Ask for Bulletin 300-A

Delapena

Exclusive Sales Representatives in U. S. A.

MOTCH & MERRYWEATHER MACHINERY CO.

PENTON BUILDING • CLEVELAND 13, OHIO



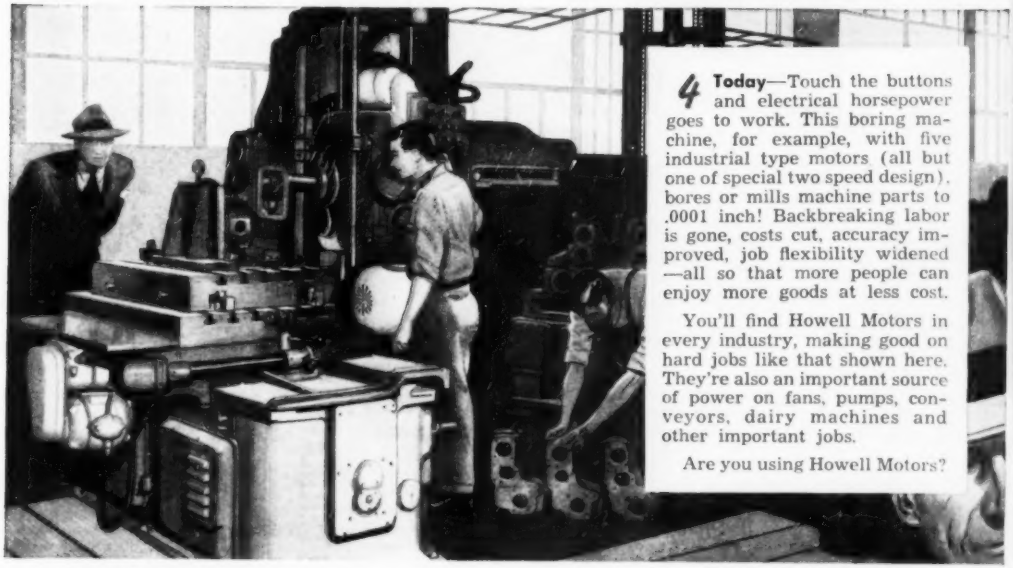
1 1865—Here's how machines looked before man applied electricity for industrial usage. Gear setups were crude. Making parts fit was a matter of luck and plenty of tinkering by operators.

2 1907—Electrical horsepower gave production a big boost. But gear mechanisms were far too cumbersome. Repairs were frequent. Men were still struggling to make one motor do the work of many . . .

3 1915—Howell "Red Band" Electric Motors arrived. These rugged, industrial type motors were specially designed to withstand hard usage. Soon, Howell Motors appeared in this and other industries.

NOW, IT'S TOUCH AND GO!

(and parts are machined quicker and to closer tolerances)



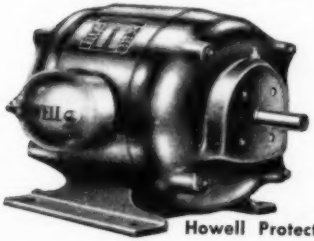
4 Today—Touch the buttons and electrical horsepower goes to work. This boring machine, for example, with five industrial type motors (all but one of special two speed design), bores or mills machine parts to .0001 inch! Backbreaking labor is gone, costs cut, accuracy improved, job flexibility widened—all so that more people can enjoy more goods at less cost.

You'll find Howell Motors in every industry, making good on hard jobs like that shown here. They're also an important source of power on fans, pumps, conveyors, dairy machines and other important jobs.

Are you using Howell Motors?

Free enterprise encourages mass production, supplies more jobs—provides more goods for more people at less cost.

Here's another precision-built Howell Motor . . . industrial type with copper or bronze bar rotors . . . specially insulated . . . statically and dynamically balanced.



Howell Protected Type Motor

HOWELL MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.

Manufacturers of Quality Industrial Type Motors Since 1915

CUT THE TIME
you take to
CUT KEYWAYS
in gears, cutters, couplings, collars, pulley hubs or what have you
with this
Minute Man®
Keyway Broach Kit
Hand-cut the correct width and depth of keyway in sixty seconds. Don't take the time and money to set up a big machine tool for this small but essential job . . . Let the "Minute Man" save you minutes and money.
CUT THIS COUPON NOW
The du MONT CORPORATION, Greenfield, Mass.
Please send me Descriptive Folder and Price List "A"
COMPANY
ADDRESS
CITY
NAME & TITLE
The du MONT CORPORATION
GREENFIELD, MASSACHUSETTS

More men pay to read American Machinist than any other metalworking publication—by many thousands.

SCHERR *aids to precision – production*

NEW!! THE CHESTERMAN INTERNAL AND EXTERNAL MEASURING MACHINE

Measures to .001 accuracy with easy reading vernier, 2½" long, in lengths as great as 80 inches (Type A) and 120 inches (Type B). A master measuring tool for determining accuracy of end measuring rods, pin gages, standard bars.

Measurments, both inside and outside, are taken from hardened steel pins or from flat jaws if desired. Calibrations in both thousandths and millimeters. Machine has heavy, stiff cast iron base. There is no substitute for this tool in its capacity and purpose.

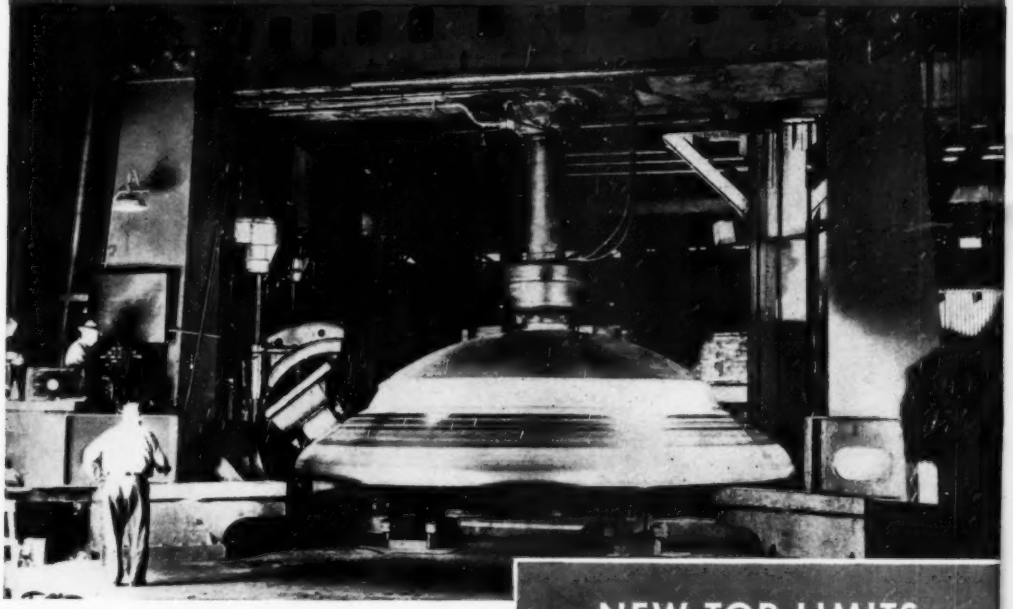
Made by the makers of the famous Chesterman Height Gage. Full details and descriptive bulletin at your request.

GEO. SCHERR CO., Inc.
200-D Lafayette St. New York 12, N. Y.

Lukens now spins the

WORLD'S LARGEST HEADS

. . . up to 20'6" O.D.

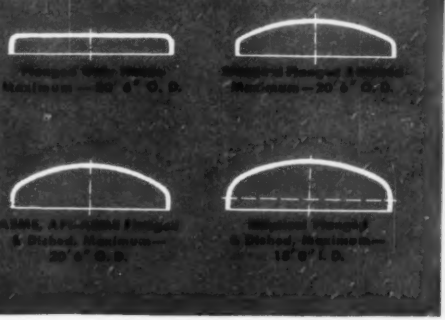


It's another "World's Largest" for Lukens—this new machine, capable of spinning heads up to 20′ 6″ in outside diameter. Now it is seldom necessary to resort to sectional flanging of heads with accompanying construction and X-raying problems.

64 years of head-forming experience at Lukens went into the design of this new machine. That same know-how guides the production of Lukens Heads in the widest range of sizes, gages, styles and materials obtainable, including Clad Steels and nonferrous metals from 4″ to 20′ 6″ in diameter, or from 3/16″ to 6½″ thick.

In addition to the 3989 standard Lukens Heads listed in Catalog No. 1, obtainable promptly from dies available, Lukens has many sizes of Standard and ASME Flanged and Dished Heads in stock listed in Bulletin 433. For copies, write Lukens Steel Company, 478 Lukens Building, Coatesville, Pennsylvania.

NEW TOP LIMITS

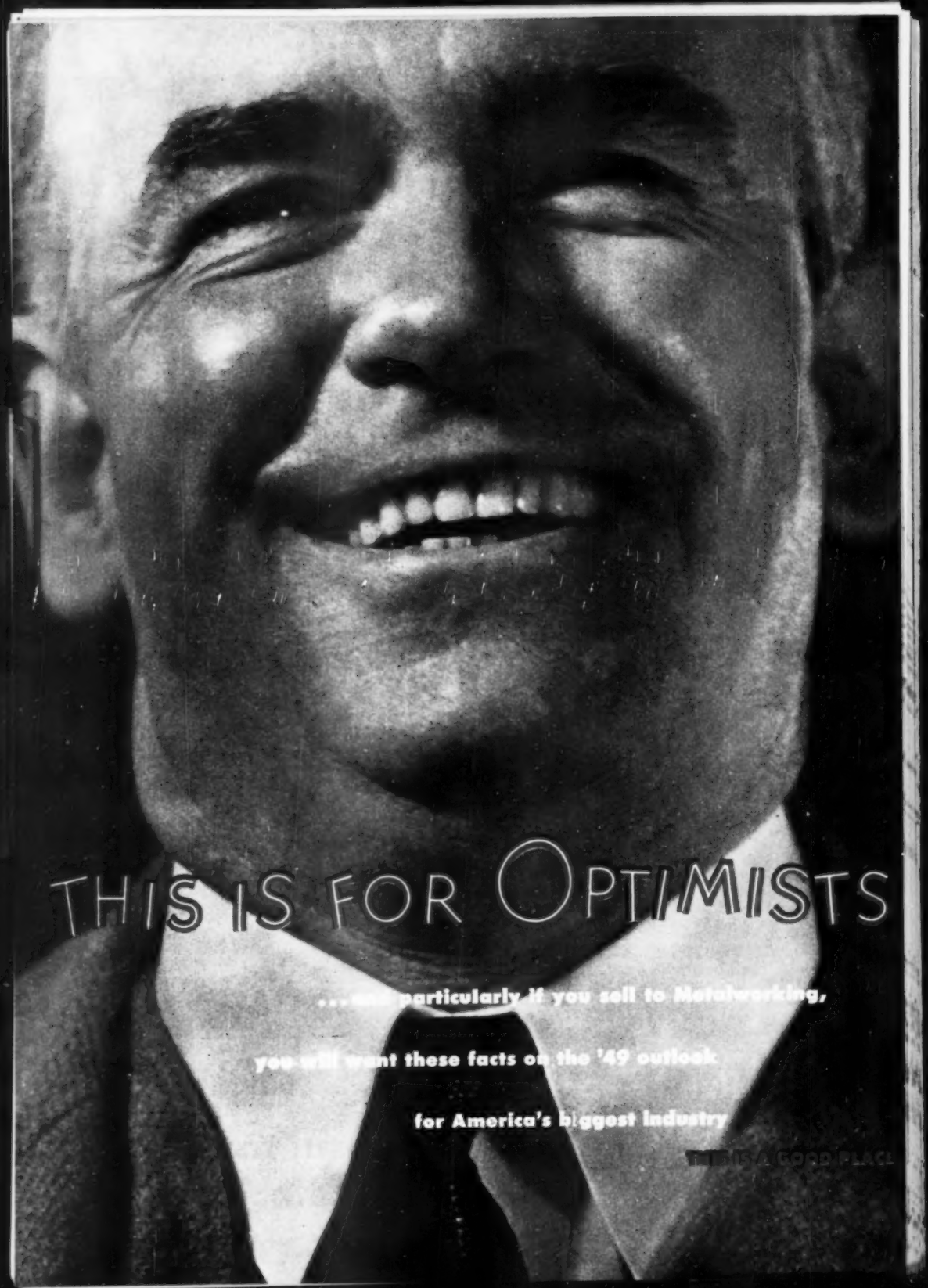


LUKENS HEADS

"Head Work", a 16mm motion picture in sound and color, on spinning and pressing of Lukens Heads is available without charge. Running time: 27 minutes. Write for a booking date.

FOUR INCHES TO OVER TWENTY FEET IN DIAMETER

• • SPEED SCRAP TO THE MILLS TO MAKE MORE STEEL • •


THIS IS FOR OPTIMISTS
...and particularly if you sell to Metalworking,
you will want these facts on the '49 outlook
for America's biggest Industry
THIS IS A GOOD PLACE

As this is written, there isn't much room for pessimism in judging the Metalworking Industry's outlook for 1949. We'd like to give you some of the reasons why:

1 People still want more metalworking products than Metalworking can produce. And they have the money to buy. They want automobiles, and top automobile executives expect 1949's production to exceed that of any previous year. People want television sets, refrigerators, new home appliances of every kind. Expanding rural electrification is reaching thousands of farm families at a time when farmers have the money to buy the metalworking machinery and appliances electricity powers. New-home construction is not expected to decrease, and every new home needs furnaces, valves and fittings, ranges, many another metalworking product.

2 Industry needs and wants more metalworking products, too. Preliminary results from McGraw-Hill's new Survey of Capital Expenditures indicate expenditures for new plant and equipment will be near 1948's multi-billion-dollar total. And Metalworking builds the textile looms, tractors, locomotives, switchgear, conveyors, presses, processing machinery and equipment every other industry uses.

3 So does the rest of the world. Metalworking's products are basic to European Recovery. Metalworking will share with food the major allocation of ECA funds... with the emphasis shifting steadily in 1949 from food to such industrial recovery essentials as machine tools, railroad rolling stock, and construction machinery.

4 And Metalworking is reflecting the world's need and desire for its products. The AMERICAN MACHINIST Index of Metalworking Production has been climbing steadily since June... from 216 to 224 in November (1939=100). It seems almost sure to pass 1948's peak of 227 before the year is over. Metalworking's own expenditures for plant and equipment top those of any other industry, and many new plants are being added *now* to the 17,000 metalworking plants employing over 25 workers each which McGraw-Hill's Census of Manufacturers listed last year. With industry's greatest concentration of industrial workers, Metalworking paces the world in the installation of the new machines which boost worker productivity:

Example One: an automotive manufacturer is expected to spend $200 million this year on new production equipment.

Example Two: another metalworking manufacturer has invested $3,000,000 in automatic feeding devices which boost production 21 per cent, free 1,000 workers for other assignments.

Example Three: already one of industry's biggest users of material handling equipment, Metalworking is now buying over 40 per cent of all the industrial trucks being sold to industry.

These facts, and many more, should make you who sell to Metalworking optimistic about 1949. And one of the best ways to translate this optimism into *sales* is through the advertising pages of AMERICAN MACHINIST. For... by every standard of media comparison...

American Machinist

ABC ABP

TO DO BUSINESS WITH AMERICA'S BIGGEST INDUSTRY

The McGraw-Hill Magazine of Metalworking Production

McGraw-Hill Building, New York 18

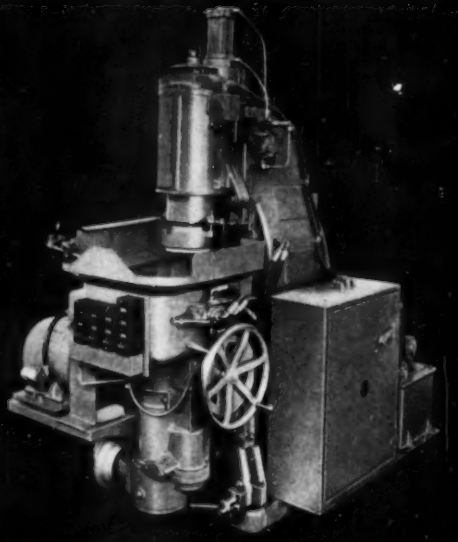
Walker High Production Vertical Grinder —the only Grinder of its kind and does not compete with other Grinders.

Specially designed primarily for the Saw, Circular Tool and Glass industries.

Can grind *flats—convex—concave* and *bevels* to 15 degrees.

Has clearance for 8" hubs and can grind to a combination of radii giving a parabolic curvature.

Electric controlled—hydraulic feed—rapid traverse.



Walker Chucks

O. S. WALKER CO. Inc.

WORCESTER 6, MASSACHUSETTS

Original Designers and Builders of Magnetic Chucks

Walker Chucks

FOR INTRICATE FORM-TOOLS

—close tolerances—quick delivery

—send specs to J & S

J & S Tool Company makes the most intricate types of form-tools to the closest tolerances for many of the leading manufacturers. Among the types that we produce are: counterbores, broaches, circular form-tools, hollow mills, gun drills, flat drills, end cutters, boring tools, step drills, watch tools, cold heading dies, recess tools, spiral form-tools, taper reamers, etc. *Save time and money by sending your specs to J & S.*

• *Also manufacturers of Fluidmotion and Form Master Radius and Angle Dressers.*

J&S TOOL CO., INC.

479 Main Street, East Orange, N. J.

Representatives in Principal Cities

BAUMBACH *The DIE SET AUTHORITY*

All Baumbach Die-Sets have demountable Leader Pins and Bushings. This exclusive feature permits removing Leader pins for machine work on the die shoe and assures reassembly without loss of alignment. A big time and trouble saver. Write for Catalog.

E. A. BAUMBACH MFG. CO., 1804 S. Kilbourn Ave., Chicago 23, Ill.

LUERS

Patented Cutting Off Tool Holders
Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured By

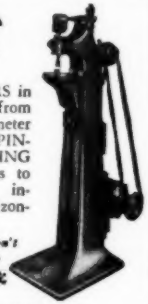
J. Milton Luers — 12 Pine St. — Mt. Clemens, Mich.

Produced under License Issued by John Milton Luers Patents Inc.

GRANT

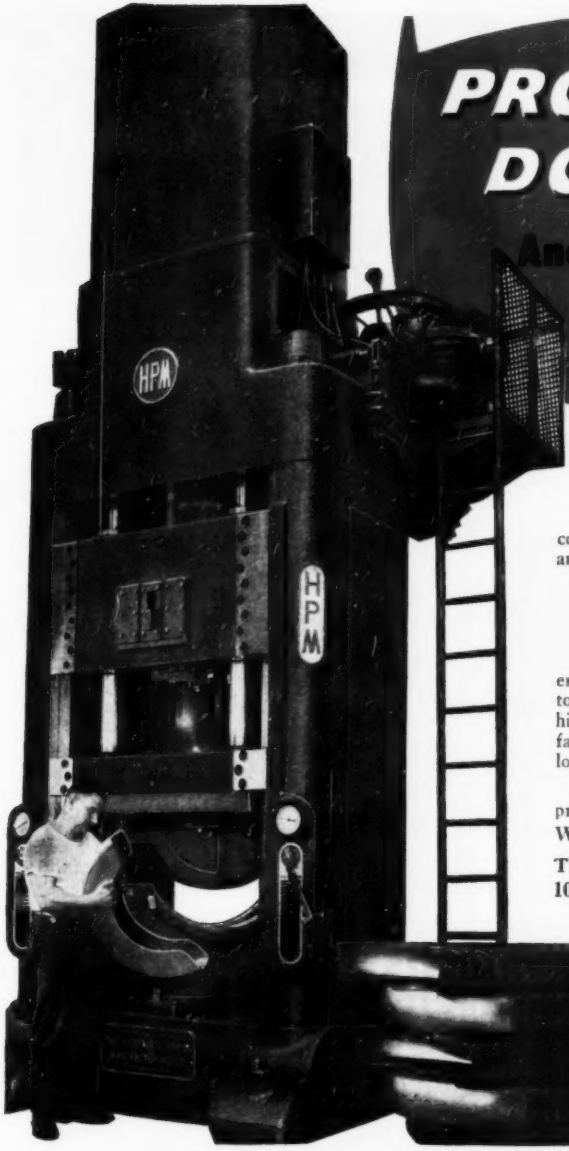
RIVETERS — PIONEERS in their line—head rivets from smallest to ⅝" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.



THE GRANT MFG. & MACHINE CO.

85 Silliman Ave., Bridgeport, Conn., U. S. A.



PRODUCTION DOUBLED!

Another H·P·M Record at Harley-Davidson

Here's what a prominent motorcycle builder accomplished when he switched fender production to an H-P-M hydraulic—

—Operations reduced from 7 to 1!
—Production increased 100%!
—Scrap loss less than 1%!

With a buyers' market making competition tougher, why not give your production a lift? A switch to H-P-M press stampings will put the skids under high production costs. Here's how—deeper draws, faster cycle, fewer rejects, quicker die change-over, longer die life—all add up to greater profits for you!

Call in a nearby H-P-M engineer to study your production. Perhaps he can save you real money. Why not make a date today?

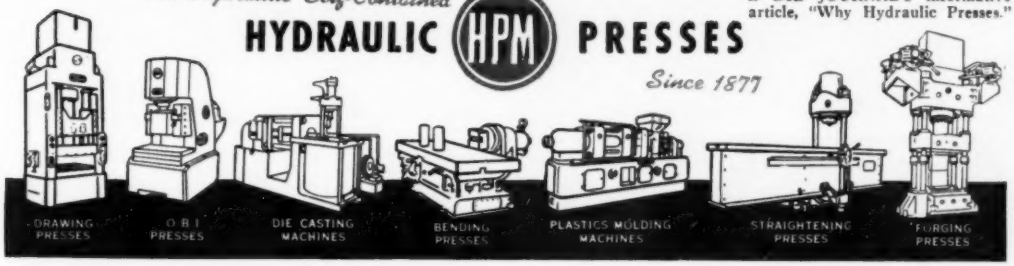
THE HYDRAULIC PRESS MFG. CO
1002 Marion Rd., Mount Gilead, Ohio, U.S.A.

Write for your free copy of TOOL & DIE JOURNAL'S informative article, "Why Hydraulic Presses."

All-Hydraulic Self-Contained

HYDRAULIC HPM PRESSES

Since 1877



ARE YOUR IDEAS ON CUTTING FLUIDS

OUT OF DATE?

Cutting fluids that once helped your machines set production records may now prevent your shop from meeting demands for increased production and lower costs. Modern machine tools can operate at feeds and speeds formerly impossible... but they require a cutting fluid that keeps work, chips and tools cool to permit maximum tool life, accurately finished work.

That's why more and more production men specify Lusol, a true solution that withdraws heat rapidly . . . permits higher speeds, closer tolerances, fewer rejects, less down time.

Send for test sample today.

F. E. ANDERSON OIL COMPANY
PORTLAND, CONNECTICUT
RUST PREVENTIVES • SPECIAL INDUSTRIAL FLUIDS • CLEANERS

Distributors in Syracuse, Cleveland, Toledo, Detroit, Chicago, Milwaukee, Louisville, Philadelphia, Dallas, Houston, Los Angeles, Denver, Tulsa
IAN49

. . . with many uses, but only one standard of precision

• For research, supervision or control—in laboratory, toolroom or production line—tests made by the "ROCKWELL" Superficial are as representative of hardness as those made on the regular "ROCKWELL" Hardness Tester. Only requirement is that, since depth of indentation is only .005" or less, surfaces must be smooth and materials homogeneous for general testing.

This instrument is especially suitable for testing very thin materia. nitrided or lightly carburized steel and areas too small for regular "ROCKWELL" Hardness Tests. A Wilson Field Service Engineer will be glad to discuss with you whether or not a "ROCKWELL" Superficial Hardness Tester will best serve your needs.

WILSON
MECHANICAL INSTRUMENT CO., INC.
AN ASSOCIATE COMPANY OF AMERICAN CHAIN & CABLE COMPANY, INC.
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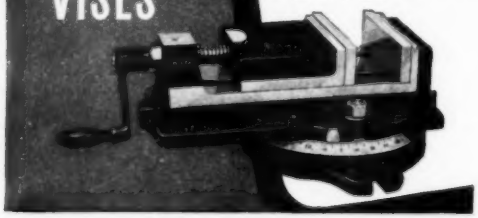

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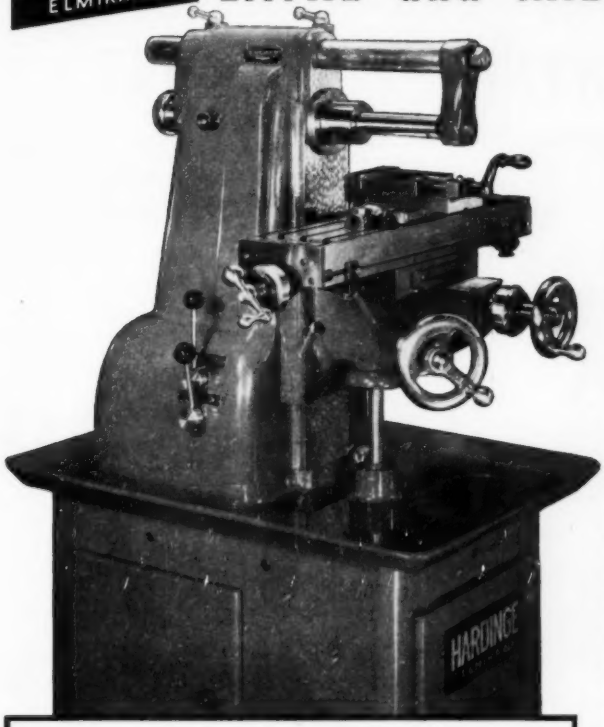

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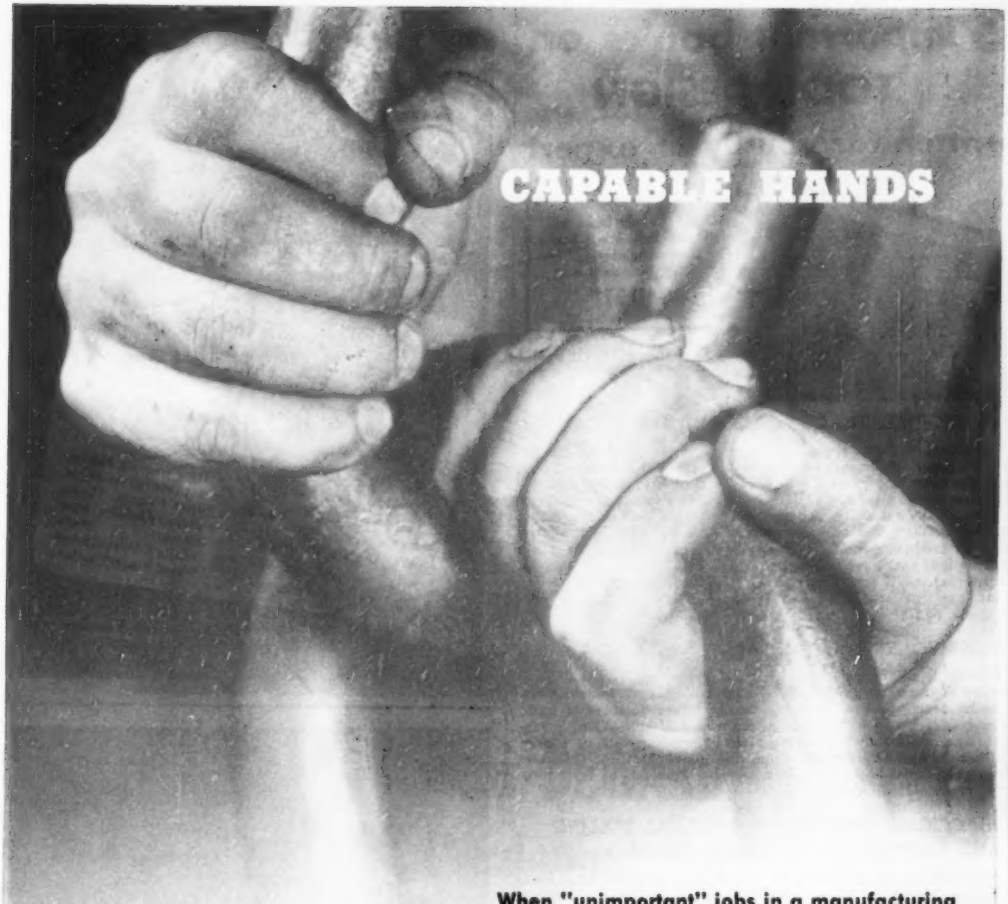

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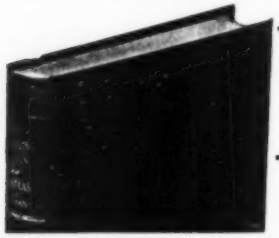

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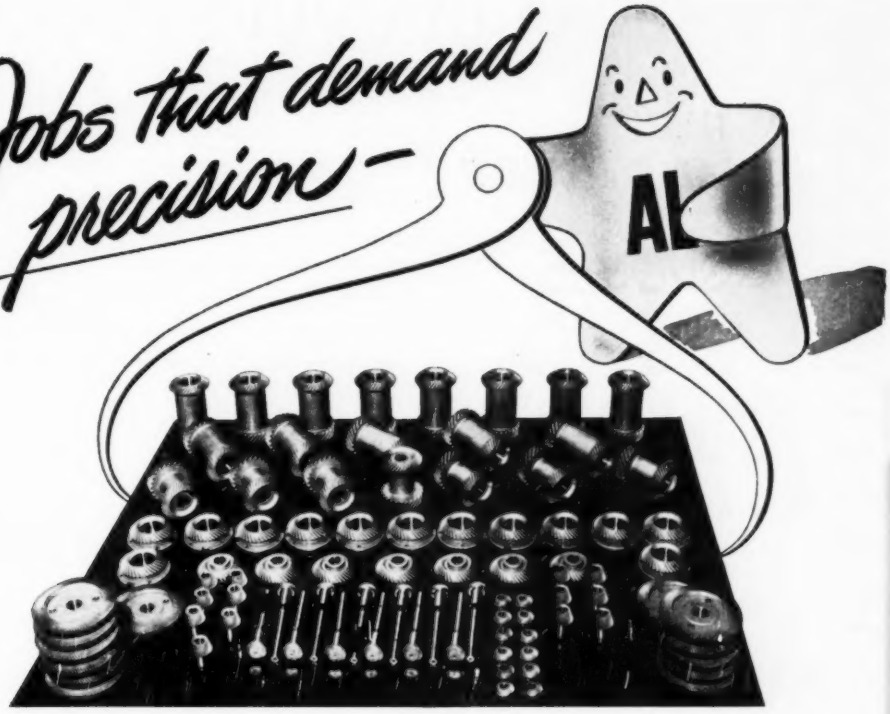

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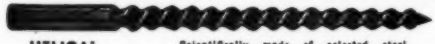

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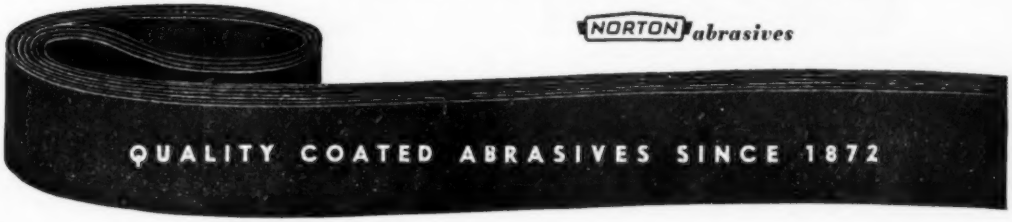

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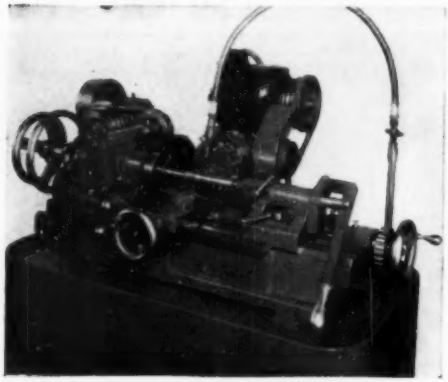

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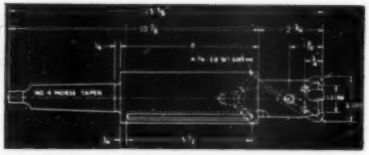

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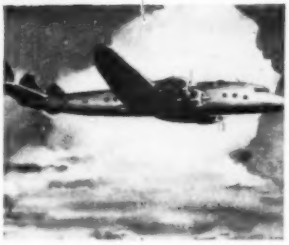

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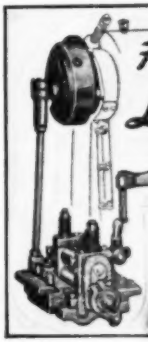

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A good lathe costs money. The new Hendey No. 2 General Purpose Lathe is not an exception, but is an exceptional value. This lathe is an entirely new concept. It replaces the famous Hendey Cone Head Lathe, but retains all the facility—with a single lever belt shifter. It has eight speeds, but no expensive geared head. A unique feature eliminates belt pull on the spindle. There are 48 thread and feed changes, and graduations permit spindle indexing for cutting multiple threads. The Bed Ways, both Carriage and Tailstock, are hardened and precision ground. Here's a lot of lathe for the money—the price will please. Write today for details and catalog.

PRINCIPAL DIMENSIONS

Rated size	14"
Swing over ways	16 7/16"
Swing over cross slide	10 1/4"
Spindle bearings—Preloaded super-precision roller bearings	
Spindle nose	L-1 taper nose
Hole through spindle	1 1/2"
Range of spindle speeds	30 to 1142 R.P.M.
Carriage bearings on ways	21 1/2"
Width and length of cross slide	7"
Compound rest travel	4"
No. of thread and feed changes	48
Range of thread cutting	1 1/2 to 92

THE **hendey** MACHINE COMPANY

MAIN OFFICE & PLANT: TORRINGTON, CONN.

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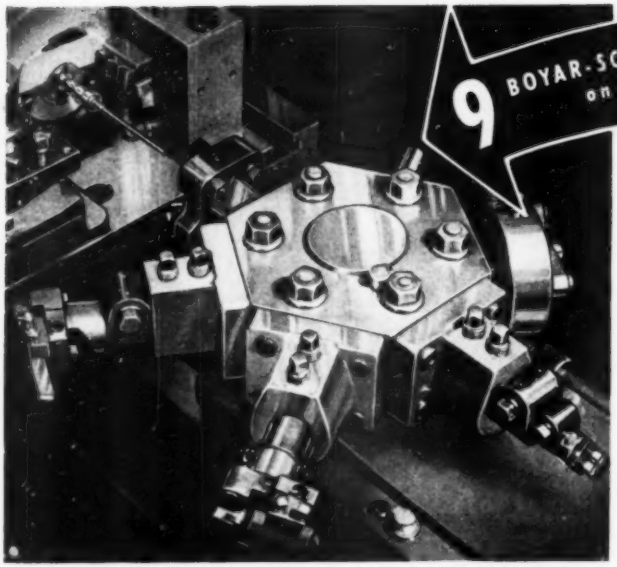


9 BOYAR-SCHULTZ SCREW MACHINE TOOLS on this turret lathe set-up

- 1 2RS Revolving Stop
- 1 3RT Turning Tool
- 2 2RT Turning Tool
- 1 ORR Roller Rest
- 4/9 Model H Precision Adapters

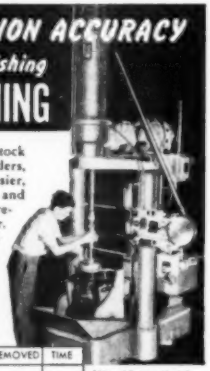
This intricate stainless steel part, 7" in length, is blanked on a Warner-Swasey Turret Lathe. Skillful use of 9 Boyar-Schultz tools guarantees accuracy throughout following operations: feed out stock; box tool long diameter; box tool step diameter; box tool diameter of collar; form profile the knob using roller rest on small diameter for rigidity; center drill.

Write for our NEW 24 page screw machine tool catalog offering you time saving tools.

BOYAR-SCHULTZ CORPORATION

2109 WALNUT STREET CHICAGO 12, ILLINOIS

Get HIGH PRODUCTION ACCURACY on internal cylinder finishing with FULMER HONING



WITH Fulmer Honing Machines, stock can be removed from internal cylinders, ½" to 30" diam., much faster, easier, cheaper, than by any other method, and maintain high accuracy. Stock removal ranges over 90 cu. in. per hour. Hold to ±.0001" tolerances on bore size, straightness, roundness, with any desired surface finish.

CHECK THESE TYPICAL PRODUCTION EXAMPLES OF FAST STOCK REMOVAL BY FULMER HONING MACHINES:

PIECE	LENGTH	DIAMETER	STOCK REMOVED	TIME
Hardened Pump Liner	27"	7.250"+.0005"	.015"—.018"	10 min.
Forged Gear Blank	Two 6" Bores	4.250"+.0002"	.005"	1 min.
Chrome Plated Diesel Liner	32"	8.500"±.0005"	.004"—.006" of chrome	3 min.

(Above) Fulmer Model 10-25, honing 5 ⅜" bore aircraft cylinder, removing .006" of stock. Rate 24 cyl. per hour.

FULMER COMPANY NOW EXCLUSIVE U. S. DISTRIBUTOR FOR ALEXANDER BALL HONING TOOLS

Available in sizes from ½" to 50" diam.

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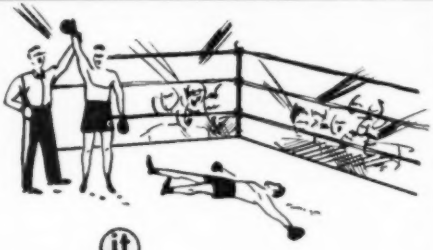

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Luck doesn't make a winner... It isn't just luck that finds COULTER MACHINES successfully at work all over the world. It's the perfect combination of more than half a century of "on-the-job" experience, plus competent personnel that know threading equipment problems, and how to solve them.

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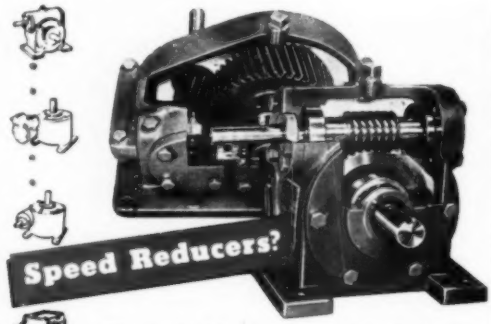

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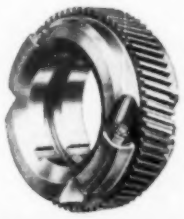
The manufacturer, design engineer and production expert make the selection of dependable gears one of their definite responsibilities.

It is common practice in hundreds of plants to specify *Cincinnati Gears, Good Gears Only*. Their precision control, accuracy and performance guarantee assured dependability.

Each Cincinnati Gear is made to fit your particular specifications . . . saves time and money and puts the right gear in the right place.



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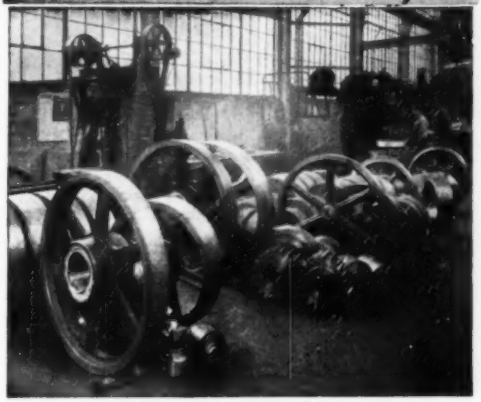

Gears in the making—that will mean the making of the machine, wherever they are used! All sizes, all types, all materials . . . the steady stream of gears that pass through the Stahl plant are destined for jobs that are exacting in precision, or heavy duty, or both, in every industry. We are equipped to handle your gear production no matter what your requirements as to size, quantity or material. When you need big gears, accurately cut and delivered on time—get a Stahl estimate first!

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A CENTRALLY BALANCED DRIVE WITH GREAT EMERGENCY STRENGTH

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The many advantages of D.O.James Motorized Gear Speed Reducers and their continued proven performance for many years make them a leading choice with power transmission designers and engineers.

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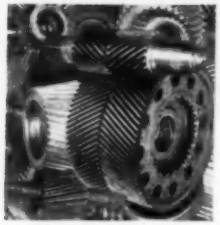

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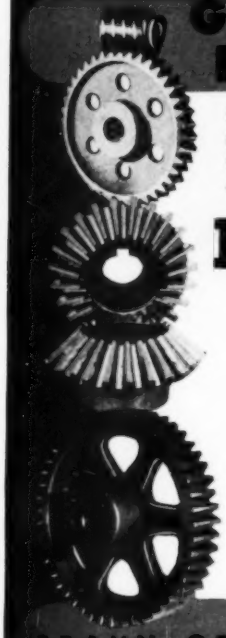

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American Machinist

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How to estimate the time any machining job will take

HERE'S the on-the-job help you need to make quick, reliable estimates of the time it takes to do the different machining operations in any machine-shop. Whether a job involves drilling, boring, tapping, threading, grinding—or any other operation—this manual tells you exactly what to consider in estimating job-time. It covers every step—from setting up the job, to tearing it down—giving reasonable time values for each, based on actual experience. The various non-machining operations which enter into the cost of any job are also given. Instructions are provided for the use of several methods of estimating specific jobs on each type of machine in use today.

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THIS book sets down the principles of machine-shop estimating so clearly and concisely that you can put them to use immediately. It teaches you step-by-step how to estimate the time it takes to manufacture specific machined parts, classifying every job into machining and handling operations. It supplies a self-explanatory breakdown of all the elements for each operation and gives the time value established for each. These time values are presented in decimal minutes and are carried out to three places. In addition the book includes: sample estimates for each operation described, tables of variables and constants, and 93 typical problems to assist you in making your own estimates accurately and speedily. 486 illuminating charts, diagrams, tables and photographs are included to illustrate the topics discussed.

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- straddle milling
- gang milling
- end-mill milling
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- screw slotting
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- honing
- splining
- band-sawing
- broaching
- and scores of others

The standard guide in machine shop work . . .

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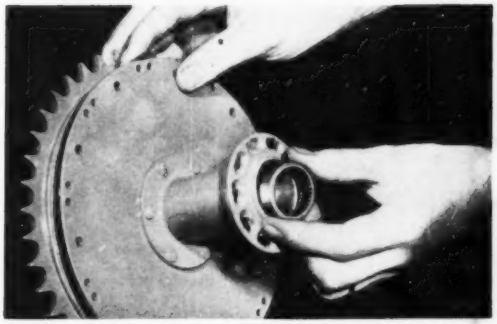
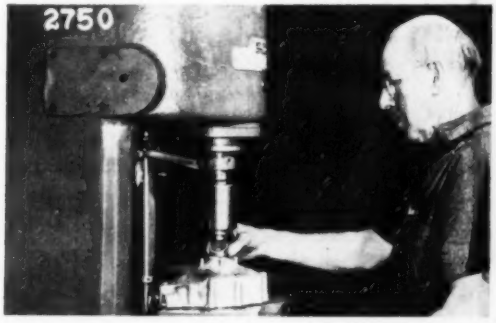
The new Arrow and Scout Motorcycles are designed throughout for lightness, power, safety and economy by Indian Motocycle Company. To withstand severe shock loads, reduce friction and secure compact design, Indian specifies Torrington Needle Bearings—22 in the Arrow and 24 in the Scout.



Needle Bearings take the jar of rough riding at high rotating speeds in the rear wheel hub (above) and the front wheel hub. With their full complement of small diameter rollers, Needle Bearings take less space and provide higher radial capacity than any other comparable anti-friction bearing.

More horsepower per pound is delivered by the new Indians. Power loss is reduced with 8 Needle Bearings in the transmission. Two Needle Bearings on the main shaft give unusual stability, assuring efficient sealing with the standard oil closures pressed in behind them.



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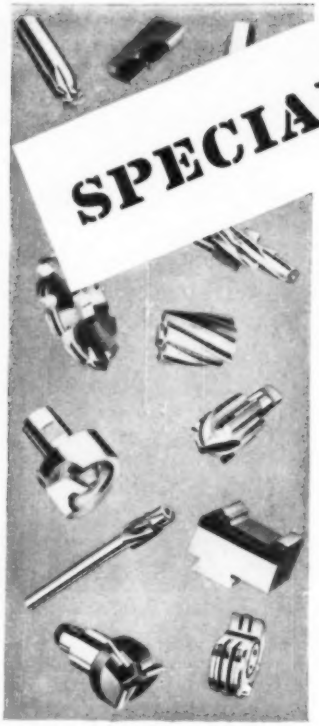
Lightweight design, high capacity, long service life and economical production can be yours with Torrington Needle Bearings. Our engineers will be glad to help you adapt these compact anti-friction units to the requirements of your equipment. Write us today. THE TORRINGTON COMPANY, Torrington, Conn., or South Bend 21, Ind. District offices and Distributors in principal cities.

TORRINGTON *NEEDLE* **BEARINGS**

Needle • Spherical Roller • Tapered Roller Straight Roller • Ball • Needle Rollers



Cutting tools by Gorham are *just that!*

Whatever your needs in special high speed steel and carbide tipped cutting tools—you can be sure of one thing: The name GORHAM means top performance and lasting quality . . . the most for your money in any tool you buy. Long experience in the selection and heat treating of metals has put GORHAM in the front rank of America's leading tool makers. You can depend on GORHAM to deliver *special* service . . . you can count on GORHAM for *special* results! Specify GORHAM for all your cutting tool needs.

GORHAM TOOL COMPANY
14400 WOODROW WILSON · DETROIT 3, MICH.

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Write for illustrated catalog
M & N MACHINE TOOL WORKS, INC.
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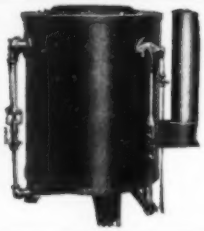
Famous for
- ACCURACY OF THREADS
- LOW CHASER COST
- ALL AROUND DEPENDABILITY

Bulletins available: General Purpose Die Heads, Insert Chaser Die Head, Threading Machines.

See our Advt. on Page 36 Feb. 10 '49 American Machinist

THE EASTERN MACHINE SCREW CORP., 29-40 Barclay St., New Haven, Conn.
Pacific Coast Representative: *A. C. Behringer, 554 N. San Pedro St., Los Angeles California. Canada: F. F. Barber Machinery Co., Toronto, Canada.*

BUZZER *Gas Fired* **POT FURNACES**



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Atmospheric Pot Hardening Furnace, tangentially fired, assures quick, even heat. Many models available — write for "BUZZER" catalog showing Gas Furnaces, Burners, and other equipment.

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ACROMARK

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ACROMARK company

7-13 MORRELL STREET
ELIZABETH 4, N. J.

One of a series *of messages to help you increase your understanding of business paper advertising, and its effect on your job.*

Does your advertising manager rate an invitation to the management table?

IF YOU SHOULD ASK *him*, he'd probably say "yes." And his reasoning might run something like this:

Management's first responsibility is to show a fair profit. This requires a relentless search for continued improvement – in design, in purchasing, in production, research and cost-accounting. Each deserves its place at the management table. Yet none of these activities can actually create a dollar of profit, for the simple reason that you can't *produce* anything at a profit – not unless you can also *sell* it.

And that's what makes the advertising manager's job so important.

His first responsibility is to see that your company's products are made familiar (and desirable) to the greatest number of prospects, at the lowest possible cost. In fulfilling this responsibility, he sets a parallel course with the sales department, although his approach more closely resembles that of the assembly line technician.

For advertising, as he sees it, is simply the application of assembly line techniques to the *manufacture of a sale*. Just consider the five basic steps involved:

1. **Seeking out prospects**
2. **Arousing their interest**
3. **Creating a preference for your product**
4. **Making a specific proposal**
5. **Closing the order**

By *mechanizing* the first three of those steps, advertising increases management's chance to show a profit. It leaves your salesmen free to concentrate on the two jobs which they alone can do, and do best.

And nowhere does this mechanizing process operate more efficiently than in the business press, where it reaches your best prospects at the lowest possible cost.

Perhaps that's why so many smart advertising managers are partial to business paper advertising – and why more of them, incidentally, are getting to sit at the management table!

American Machinist

is a member of The Associated Business Papers who have just published a book entitled, "Copy that Clicks"—with readers." Next time you see your advertising manager, ask him to show it to you. And if you'd like a copy of your own, we'll be glad to mail you one.

VITRIFIED

Keep Production on its toes by standardizing on . . . .
VITRIFIED GRINDING WHEELS

The Vitrified complete line includes also Silicate, Shellac and Resinoid bonded wheels for conditions requiring high finish, elasticity and heat resistance.

Vitrified Wheels

Grinding equipment—for tools or for production requirements—can be brought to higher degrees of precision and speed by standardization of Grinding Wheels.

These objectives can easily be realized through the use of Vitrified Wheels for every grinding operation, because Vitrified offers a complete line of sizes, shapes and types, processed especially for the work to be handled.

. . . Cast Iron, Bronze, etc., can be ground at low cost and efficiency on Vitrified Carborite Wheels.

. . . For accurate, fast grinding of steel on a production basis, Vitrified Borite Grinding Wheels increase output and reduce costs.

. . . also, make Silicate, Shellac and Resinoid Bonded Wheels.

Ask a Vitrified representative to show you how economically you can modernize your grinding operations by standardizing on Vitrified Wheels.

VITRIFIED WHEEL CO.
WESTFIELD MASS.

To prepare steel for painting

PRE-PAINT RECOMMENDATION
1st Stage - Spray 3
OAKITE CRYSCOAT
2nd Stage - Rinse

FOR low cost . . . for fast, thorough cleaning . . . for strong grip of paint on steel . . . for smooth, lustrous final paint coat . . . there is nothing to equal the OAKITE CrysCoat PROCESS.

FREE Write today to Oakite Products, Inc., 24 Thames St., New York 6, N. Y., for more information on the OAKITE CrysCoat PROCESS or Oakite methods for:

Precleaning in tanks or machines • Alkaline cleaning in tanks or machines • Pickling • Barrel cleaning • Electrocleaning • Steam-gun cleaning • Paint stripping • Rust prevention

OAKITE 1909 1949 40 ANNIVERSARY YEAR

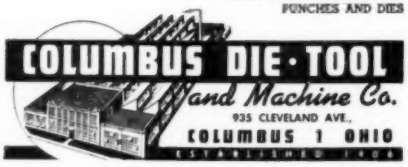
OAKITE
REG. U. S. PAT. OFF.
INDUSTRIAL CLEANING MATERIALS • METHODS • SERVICE

Technical Service Representatives Located in Principal Cities of United States and Canada

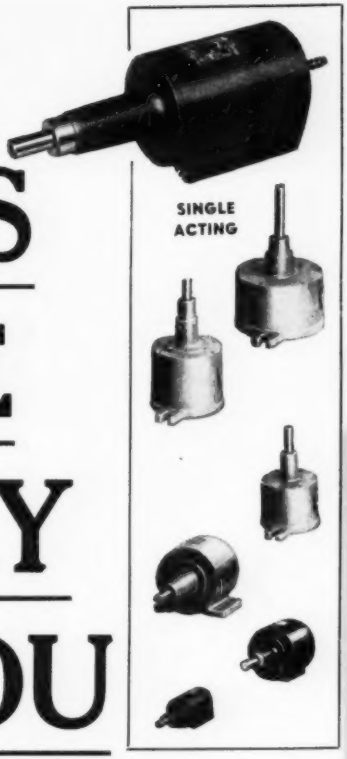
ACCURACY
Efficiency
Economy

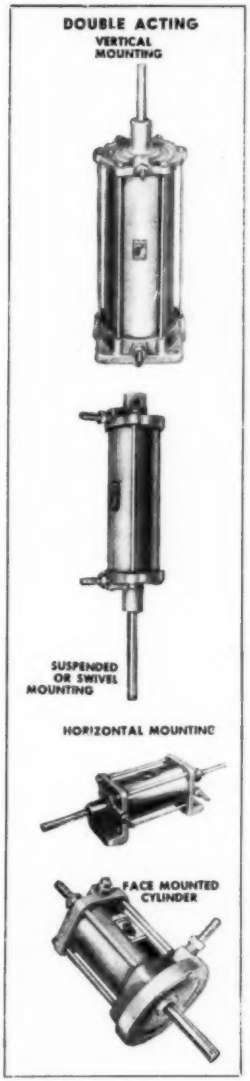
These three factors are the key-note of our special tools and machinery. Columbus Die-Tool builds and designs the tool for your particular purpose and will solve the toughest tooling problems effectively and promptly. Do not hesitate to consult us, our experience in this field is most comprehensive.

JIGS • FIXTURES • SPECIAL TOOLS
BUILDING COMPLETE MACHINE TOOLS
UNITS FOR MACHINE TOOLS
PUNCHES AND DIES



MEAD AIR CYLINDERS SAVE MONEY FOR YOU





Illustrated on this page are a few of the many simple, adaptable, compact Mead Air Cylinders in use throughout industry now—cutting costs and speeding production. If you, too, desire to solve your work-holding problems quickly and economically, investigate Mead single and double acting air cylinders. Available in numerous vertical or horizontal mountings in a wide range of sizes.

SINGLE-ACTING STROKES

Bore	Horizontal	Vertical
1"	⅝"	⅝"
2¼"	1" 2" 3"	1" 2"
3"		½" 2"
4"	2" 2½"	2"
5"	3"	3"
6"	3"	2"

DOUBLE-ACTING

Mounting		Bore
Horizontal	1½"	2¼" 3" 4" 5"
Vertical		2¼" 3" 4" 5"
Face		2¼" 3" 4" 5"
Swivel		2¼" 3" 4" 5"

Length of stroke optional

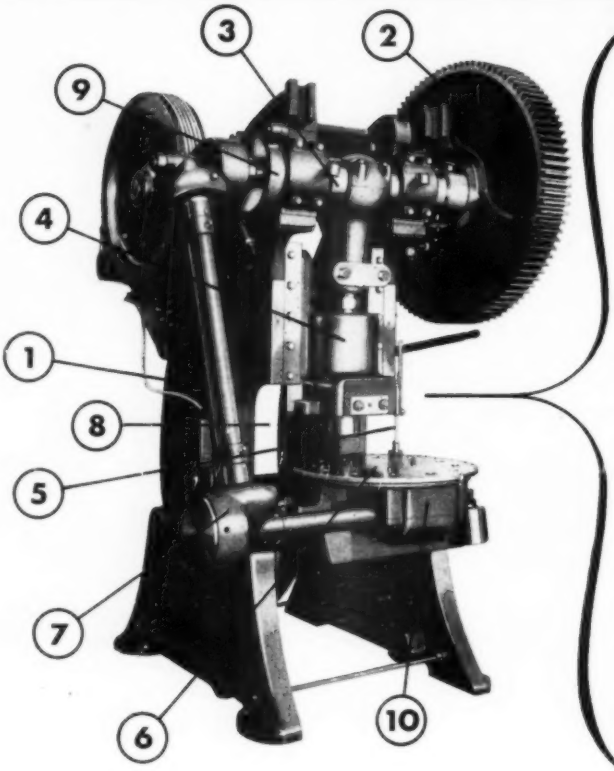
Write for Mead Air Power Catalog describing single and double acting Cylinders, Workfeeders, Valves, Impact Hammers, Clamps, Presses and other air-operated devices.

4114 NO. KNOX AVE., DEPT. MA-39, CHICAGO 41, ILL.

COMPARE SIMPLICITY—EFFICIENCY—ECONOMY—YOU'LL CHOOSE MEAD

10 REASONS WHY

FEDERAL DIAL FEEDS ARE A BUY!



1. **FRAME**—Extremely rugged. Built for continuous operation under severe loads...high tensile cast iron.
2. **FLYWHEEL**—Solid web-type fitted with Timken bearings since 1929.
3. **CRANKSHAFT**—Forged from high carbon steel, turned and ground to exacting specifications.
4. **RAM**—Symmetrical, assuring equal distribution of weight and balance.
5. **SAFETY STOP MECHANISM**—Protects dies and work from jamming.
6. **DIAL PLATE**—Designed according to each specific operation. Easily removed for application of dies.
7. **MOVING PARTS ENCLOSED**—Safety of operator assured by covering of bevel gears and shafts.
8. **OPEN-BACK, INCLINABLE**—Permits quick access to dies, easy adaptation for automatic feed or ejection.
9. **BRAKE and BEARING**—Spring tension brake allows for heat expansion; bearings honed to exact size.
10. **CAM**—Hardened and ground to assure perfect alignment of work plate.

Batteries of Federal Dial Feed Presses are in operation in many leading industrial plants—performing dependably day after day in difficult and varied assignments; saving time, trouble and money for their owners. Federal Dial Feeds may help solve a specific problem for you. No matter what the task—forming, staking, broaching, crimping, piercing or assembling—Federals give fast, smooth, safe operation. Available in eight sizes to fit your requirements. Write today for the new Federal Dial Feed catalog.

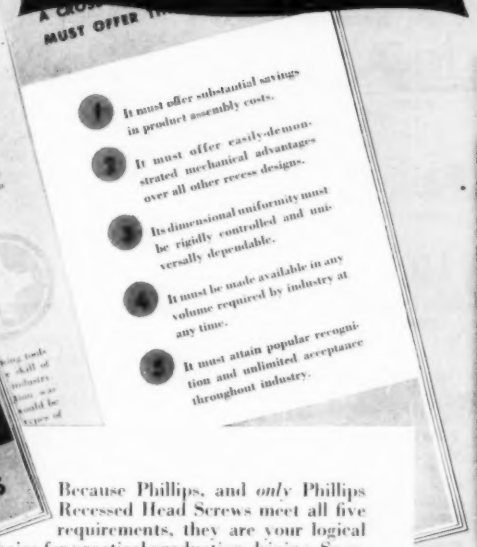
The Federal Press Company, 491 Division Street, Elkhart, Indiana. Phone 2831.

FEDERAL *Dial Feed* PRESSES

BUILT FOR SERVICE

This booklet tells you why...

ONLY PHILLIPS SCREWS offer these 5 essentials of a STANDARD Cross Recessed Head Screw


1 It must offer substantial savings in product assembly costs.
2 It must offer easily-demonstrated mechanical advantages over all other recess designs.
3 Its dimensional uniformity must be rigidly controlled and universally dependable.
4 It must be made available in any volume required by industry at any time.
5 It must attain popular recognition and unlimited acceptance throughout industry.

Because Phillips, and *only* Phillips Recessed Head Screws meet all five requirements, they are your logical choice for practical production driving. Specify Phillips and gain *all* the advantages that *standard* Cross Recessed Head Screws can contribute to your product's manufacture.

Everyone in Industry responsible for screw selection should have this Fact-Full Booklet.

It lets you in on the important facts you can't afford to overlook when you choose cross recessed head screws. It's FREE. Use the coupon . . . send it today.

PHILLIPS *Recessed Head* SCREWS

Wood Screws • Machine Screws • Self-tapping Screws • Stove Bolts

27 SOURCES

American Screw Co.
Camcar Products Co.
Central Screw Co.
Continental Screw Co.
Corbin Screw Div. of American Hdwe. Corp.
Elco Tool & Screw Corp.
The H. M. Harper Co.
Lamson & Sessions Co.
Milford Rivet and Machine Co.
National Lock Co.
National Screw & Mfg. Co.
New England Screw Co.
Parker-Kalon Corporation
Pawtucket Screw Co.
Pheoll Manufacturing Co.
Reading Screw Co.
Rockford Screw Products Co.
Russell Burdsall & Ward Bolt & Nut Co.
Scovill Manufacturing Co.
Seaboard Screw Corp.
Shakeproof Inc.
The Southington Hardware Mfg. Co.
The Steel Company of Canada, Ltd.
Sterling Bolt Co.
Stronghold Screw Products, Inc.
Wales-Beech Corp.
Wolverine Bolt Company

Phillips Screw Mfrs., c/o Horton-Noyes Co.
1800 Industrial Trust Bldg., Providence, R. I.

Send me the new booklet—"How to Select Recessed Head Screws for Practical Production Driving".

Name .....

Company AM-3R

Address .....

BAKERY

RAILROAD

WOODWORKING

SHIPYARD

AIRPORT

STONE PRODUCTS

TEXTILES

They're all
equally as important
as mines and rolling mills

TO MAKE MORE STEEL

PAPER

COSMETICS

PAINT

DAIRY

DISTILLING

DRUGS

BOTTLER

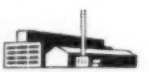
ELECTRICAL GOODS

POWER PLANT

PUBLIC WORKS

RUBBER GOODS

LUMBER


OFFICE EQUIPMENT

PRINTER

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MUNICIPAL

INSTITUTION

RESTAURANT

SHIPPING

LAUNDRY

GLASS

PACKAGING

CHEMICALS

FOOD PRODUCTS

UTILITY

PETROLEUM

Half the melting stock used in a steel mill or iron foundry consists of scrap.

In normal times, enough scrap is produced by the mills, foundries, railroads, scrap dealers and fabricators to fill the need.

But although the mills are now working at capacity, the greatly increased demand for steel and castings has outstepped the supply of the heavy scrap that makes the best steel—and at the fastest rate.

The quickest way to increase the production of steel and castings is to increase the supply of heavy scrap.

That is why we are calling on plants in NON-METALWORKING industries to provide the needed heavy scrap NOW.

One million extra tons are needed!

You Have the Heavy Scrap Needed to Make More Steel

Enough obsolete machinery, equipment and parts are being carried as useless inventory in *non*-metalworking plants to give a big push to the production of steel. Surveys have proved this.

The trick is to get that old iron and steel into the hands of the steel producers and foundries.

We're putting that job up to *you*.

To help increase steel production . . . provide more steel for fabricating the equipment you want . . . *to build an emergency reserve for national security* . . . turn in your useless heavy scrap to your local scrap dealer.

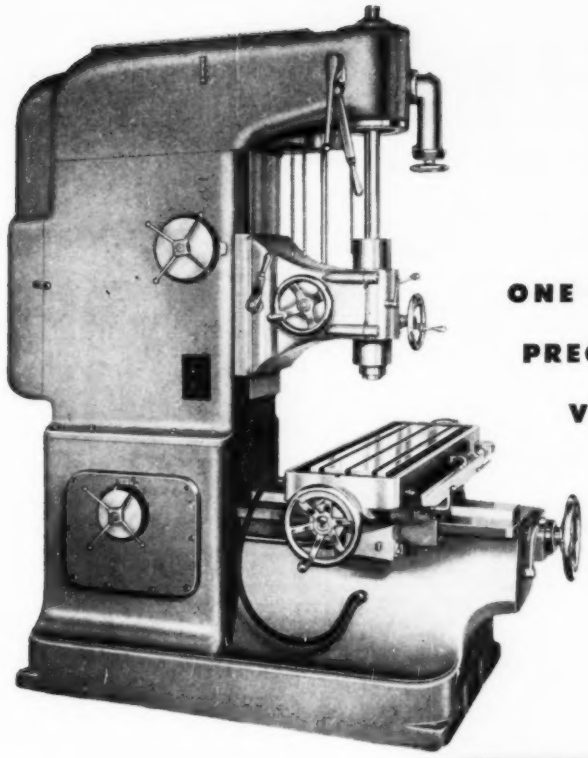
What You Can Do to Help Step Up Steel Production

1. Appoint one top official in your plant to take full responsibility for surveying the plant and getting out the heavy scrap.
2. Consult with your trade association's Scrap Drive Committee about its program to help the scrap drive.
3. Call on your local scrap dealer to help you work out a practical scrapping program.

A PUBLIC SERVICE PROJECT · THE ADVERTISING COUNCIL

SCRAPPY SAYS:
Search your plant for HEAVY SCRAP
...Help make MORE STEEL!

AMERICAN MACHINIST



ONE MACHINE FOR BOTH PRECISION BORING and VERTICAL MILLING

the KNIGHT No. 50 makes it possible to accomplish an exceptional range of boring and milling jobs without work transfers or extra setup time — operations that would otherwise be impossible except on ***two or more machines.***

Sixteen Spindle speeds, 40 to 2000 r.p.m. • 9 Spindle feeds, .005" to .010" • 100" table traverse per minute in both directions • 16 Table feeds, 5/16" to 20" per minute • 7½ h.p. Drive.

Unusual accuracy is assured by a heavy single-column casting, rugged and rigid bed-type construction, wide bearing surfaces and precision gearing. Extreme cross and longitudinal table travel, long spindle travel, controls that make operation convenient and effortless, plus power to spare are additional features that contribute to increased output, reduced time losses, improved work quality and much lower costs.

If your problem is to produce more and more for less and less it will pay you to get all the facts quickly about the Knight No. 50.

RETURN THE COUPON FOR COMPLETE CATALOG

Attach This Coupon To Your Letterhead

W. B. KNIGHT MACHINERY COMPANY

3920 WEST PINE BLVD.
ST. LOUIS 8, MISSOURI

MORE GOODS for MORE PEOPLE at LOWER COST

W. B. KNIGHT MACHINERY CO., 3920 West Pine, St. Louis 8, Mo.
We would like to have your catalog on the No. 50 and other Knight Milling Machines.

Name_____

Title_____

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

DISPLAYED RATE

(Not available for equipment advertising)

90¢ per line, minimum 4 lines. To figure advance payment count 5 average words as a line.

INDIVIDUAL EMPLOYMENT WANTED advertising rate is ½ above rates, payable in advance.

PROPOSALS, 90 cents a line an insertion.

INFORMATION

BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 1 line additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

The advertising rate is $9.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches to a page. A.M.

NEW ADVERTISING received by 10 A. M. March 8th will appear in the issue of March 24th subject to limitation of space available

CONTRACT WORK

F. F. SLOCOMB CORPORATION
Wilmington 99, Delaware

Builders of Special Machines a Specialty. Facilities Available for Production. Quantities of Small and Medium Precision Parts.

Equipment List on Request

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us — we will take care of them.
GENERAL PATTERN WORKS
2733 Rack Street Cincinnati, Ohio

SPIRAL BEVEL GEARS

Production facilities available on late model Gleason generators.

ARROW GEAR COMPANY
Worth, Illinois Phone: Worth 370J2

WANTED

WANTED

Bliss Presses #5012.
Waterbury Farrell Presses #6600, #1250, #1530

JARCO METAL PRODUCTS CO.
631 W. 50th St., New York City 19

Late type Warner & Swasey Turret Lathe—#3, #4 or #5. Advise serial number, year of mfg., condition, equipment and tooling. Must be priced right.

W-7949, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED

1—Lathe—Approx. 18" Swing 10' Centers
2—Radial Drills—3' Arm 9" Column
1—#2 Cincinnati Milling Machine or equivalent late type

Please give particulars in first letter.

W8155 AMERICAN MACHINIST
330 W. 42nd Street, New York 18, N. Y.

SALES AND SERVICE ENGINEER

Nationally known twist drill manufacturer requires sales engineer to cover New York City, Philadelphia, and Baltimore area. Send brief resume of experience and other pertinent data. State salary desired. Address reply to 1166 Penobscot Building —Detroit 26, Michigan.

REPLIES (Box No.):
Address to office nearest you
NEW YORK: 330 W. 42nd St. (18)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

SELLING OPPORTUNITIES OFFERED

SALES REPRESENTATIVE wanted for State of Michigan by well-known manufacturer of inserted blade metal cutting tools. Exclusive commission basis. Write SW-8026, American Machinist, giving details of past and present experience, also lines handled at present.

WE NEED a live and experienced salesman for die heads and other small tools. For a man with ability and who can assume responsibility, this is a good opportunity for future advancement. Give outline of experience, age, names of companies, as well as salary expected. This will be treated as strictly confidential. SW-8110, American Machinist.

EMPLOYMENT SERVICE

SALARIED POSITIONS $3,500-$25,000. If you are considering a new connection communicate with the undersigned. We offer the original personal employment service. 39 years recognized standing and reputation. The procedure of highest ethical standards is individualized to your personal requirements and develops overtures without initiative on your part. Your identity covered and present position protected. Send only name and address for details. R. W. Bixby Inc., 266 Dun Bldg., Buffalo 2, N. Y.

ENGINEERS: LARGE college offers $3000, approx. half time teaching-studying. All ranks univ. positions, experienced $4500-$6500 nine months. Give phone, photo, qualifications. Cline Teachers Agency, East Lansing, Mich.

SELLING OPPORTUNITIES WANTED

MANUFACTURERS REPRESENTATIVE in the Pittsburgh district wishes to handle bar steel, sheet steel, forgings, cast steel and cast iron castings accounts. Fifteen years industrial sales experience in this territory. RA-8138, American Machinist.

CORNELL GRADUATE Engineer—Desires engineering products to sell in Indiana territory on straight commission basis. RA-8752, American Machinist.

PATENT ATTORNEY

Patent Practice

before U.S. Patent Office. Validity and infringement investigations and opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine and Rommel, Registered Patent Attorneys, Suite 453, 815-15th Street, N. W. Washington 5, D. C.

"WALSH" PUNCH PRESSES

Size	Stroke	Delivery
6 Ton	1¼" or 1½"	10 days
12 Ton	1½" or 2"	Immediate
18 Ton	2" x or 2½"	Immediate
20 Ton	2½" or 3"	Immediate
24 Ton	2" or 2½"	Immediate
28 Ton	2½" or 3"	Immediate
38 Ton	3", 3½" or 4"	Immediate
55 Ton	3" or 3½"	Immediate
65 Ton	4" or 4½"	Immediate

All Presses Complete with Drive, Motor, Counting and Safety Devices. Roll Feeds For All Presses. Two Weeks Delivery. Time Payments Arranged. Exclusive Distributors.

SCHULTZ & ANDERSON CO.
115 Edison Place, Newark, New Jersey
Tel. MArket 2-4318

FOR SALE

1—Used #1 BD Brown and Sharpe Plain Mill, Serial #1912
1—#5 Universal Turret Lathe, Serial #16492
1—Used #5 Bardons and Oliver Universal Turret Lathe
1—#1B Cincinnati Plain Auto. Milling Machine and Accs.
1—Sundstrand #2 Electromil and accessories with 4 motors
1—Sundstrand Electromil and accessories with 4 motors
1—Cincinnati #2 Pin. cutter and tool grinder
1—#3B Edlund—3-spindle drill press with accs.
#12-B High P & W 2 spindle profiler
1—Jones and Lamson Turret Lathe
1—#3 Jones and Lamson Ram Type Turret Lathe, with attachments, Serial #63722.
1—#3 Jones and Lamson Ram Type Turret Lathe with attachments Serial No. 63712

Acme Aluminum Alloys, Inc.
232 No. Findlay St., Dayton 3, Ohio

SHEET METAL MACHINERY

NEW and USED — HAND and POWER. Apron Brakes, Press Brakes, Shears, Forming Rolls, Power Presses, Pittsburgh Lock Machines, Spinning Lathes, Spot Welders, etc.

MONA MEMBER
B. D. BROOKS, INC.
361 Atlantic Ave., Boston 10, Mass

FOR SALE

Industrial Deepfreeze "Cascade"—3 stage compressor with 2—½ HP and 1—¼ HP motors all single phase, 110 volts. Removes, 1,000 BTU's per hour at —120°. 24" x 30" deep chamber. Santoset insulation. For shrinking, testing and treating of metals. Excellent condition. Complete $1,500.00.

THE VAN KEUREN CO.
176 Waltham St., Watertown, Boston, Mass.

PRACTICALLY NEW

TOLHURST CENTRIFUGAL 40" CHIP WRINGER, SERIAL #T-8643-A, BASKET RPM—700. Complete with 7½ HP, 3/60/220/440 Motor. PRICE $1,000.00

WINSTON MACHINERY CO., INC.
517 South Delaware St., Indianapolis 4, Ind.

Your inquiry will have special value . . .

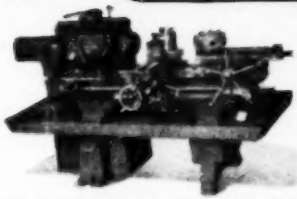
if you mention this magazine, when writing advertisers. Naturally, the publisher will appreciate it . . . but, more important, it will identify you as one of the men the advertiser wants to reach with this message . . . and help to make possible enlarged future service to you as a reader.

BUY FROM STOCK
Telephone
MAIN 6347-6348

FALK
MACHINERY COMPANY

18 WARD ST.
ROCHESTER 5
N. Y.

Every Item Guaranteed as Represented



Warner Swasey #3 Universal Geared Head Bar Feed Ram Type Turret Lathe. Late Type. 3/60/220/440 volts motor. FIVE AVAILABLE—some have tooling.

TURRET LATHES

Morey #2 Geared Head 1" Cap., M. Dr.
Simmons Microspeed 1" Cap., M. Dr.
Oster #60I Hand Screw Machine 1½ cap.
W-Swasey #4 Univ. 1¼" cap., M. Dr.
Jones & Lamson #3 Univ. Bar Feed, 1½"
W-Swasey #3 Univ. 1½" cap., M. Dr.
Gisholt #4 Univ. 2" cap., M. Dr.
W-Swasey #2A Univ. 2½" Cap., M. Dr.
Bardons & Oliver #7, Univ. 2½" Cap.
W-Swasey #3A Univ. 3½" cap., M. Dr.

Buffalo #0 Bending Rolls. Pinch Type, motor driven. With formers for bending angles, rounds, squares, pipe.
Buffalo #1 Wrapping Rolls. Motor driven. Capacity— 3½x3/8x9
Niagara Initial Type. 12'x1/16" capacity.
Webb #2L 5'x10ga. Initial Type Bending Rolls. 5 h.p.

Barnes #307 Single Spindle Hydraulic Twin Cylinder Vertical Honing Machine. Late Type complete with coolant system and 220/440 volts motors and controls. Six speeds, #5 morse taper. TWO AVAILABLE. One has Positive Depth Stop & Dwell Mechanism.

ENGINE LATHES

36"x30' LeBlond Geared Hd. Motor Dr.
32"x16' Bridgeford, Geared Head, M. Dr.
28"x10' Davis Quick Change Gear
26"x18' Bridgeford, Geared Head, M. Dr.
25"x14' LeBlond Motorized
24"x18' American Q.C.G. Grd. Hd. 11' centers, Taper Attach. Motor Dr. Equipment
24"x14' Lodge & Shipley, Motorized
24"x16' American Motorized
24"x12' Putnam, Quick Change Gear
24"x10' LeBlond, Quick Change Gear
21"x18' LeBlond, Motorized
20"x11' Schumacher-Boye, Q.C.G.
20"x10' American, Q.C.G. 72" centers
20"x10' Hendey, Q.C.G. motor dr.
20"x8' Lodge & Shipley, Q.C.G. M. Dr.
18"x8' Davis Q.C.G. 42" centers, equipment
18"x8' Lodge & Shipley, geared head
18"x8' Hendey Q.C.G. 49" centers
18"x7' Lehman, Q.C.G. M. Dr.
18"x6' American, Geared Head, M.D.
16"x12' South Bend Q.C.G. Enclosed Head Underdriven with 1½ h.p. motor & controls. 105½" centers. NEW—1946. Has chuck, turret tool post, 2-steady rests, faceplates. Excellent condition. Immediate delivery from stock.
16"x8' Hendey Q.C.G. M. Dr.
16"x6' Lodge & Shipley Geared Head
16 x6' Lodge & Shipley "Patent Head", Motor Dr.
16"x6' South Bend Enclosed Head, Motor driven. Taper Attachment, Chucks, Collets & Quick Acting Collet Chuck.
14½'x6' South Bend Enclosed Head, Motor Driven. Taper Attachment, chucks, Turret Toolpost Threading Dial, Ram Type Turret Attachment, collets & Collet Chuck.
14"x8' Reed-Prentice Eight Speed Selective Geared Head, Q.C.G. Motor driven w/220/440 volts motor & controls. Has Taper Att. chuck, faceplates, steady rest, cabinet legs, max. centers —48". Completely rebuilt. Immediate shipment from stock.

GRINDING MACHINES

J & L #TG-615 Automatic Thread, M. Dr.
Norton 6x18 Vert. Surface, Excello Spindle
Norton 6x18 Horiz. Surface, Excello Spindle
Brown & Sharpe #2 Auto. Surface, 6x18
Pratt & Whitney 14x36 Vertical Surface
Blanchard #16, 26" Vertical Surface
Abrasive Automatic Surface 22x8
Reid #2 Automatic Surface, 6x18
Heald #25 Rotary Surface
Brown & Sharpe #2 Face, motorized
Rivet #3 Internal, Cone driven
Heald #70 Internal, Belt drive
Heald #60 Internal, Belt drive
Norton #2 Univ. Tool & Cutter, Belt Dr.
Cincinnati #1½ Univ. Tool & Cutter, Belt Dr.
Oakley #3 Tool & Cutter, Belt Dr.
G & Livingston #4 Tool & Cutter
Cincinnati #2 Tool & Cutter, M. Dr.
Cincinnati "Monoset" Tool & Cutter
Cincinnati #2 Centerless, M. Dr.
Besley Dbl. End Disc, 30" dia. discs
Greenfield #12 Internal Hydraulic
Brown & Sharpe #10 Cylindrical 6x18
Brown & Sharpe #11 Cylindrical 10x30
Brown & Sharpe #4 Univ. Cylindrical 12x60
Brown & Sharpe #5 Plain Cylindrical
Oliver of Adrian #51 Drill Grinders
Thompson 6x18 Hydraulic Horiz. Surface. Wet & dry work. 220/440 motor driven. Auto. downfeed to head. Motor driven exhauster unit.
NEW—Leach 6x12 Horiz. Surface. 220 volts motor, ball-bearing Spdle. Permanent magnetic chuck. Immediate shipment from stock.
Norton 6x36 Horiz. Surface. 220/440 volts motor. Has extra grinding wheels and 40x9 chuck. For wet & dry work. Excellent condition.

AUTOMATICS

No. 0 & No. 00 Brown & Sharpe
No. 0 Brown & Sharpe Automatic Cutoff
#2G Brown & Sharpe High Speed Automatic Screw Machine. Serial #6814. Self-contained 5 h.p. 3/60/220/440 volts motor drive & controls. Complete coolant, toolposts, gears, collets. TWO AVAILABLE.
#2 Brown & Sharpe Automatic. Turner drive 220/440 volts motor. With Stock stands, collet, toolposts, coolant system, change gears.
Cleveland Model "A" 3¾" capacity Single Spindle Motor Driven Automatic. Has lot of tooling, collets, motors and switches & coolant system.

PUNCH PRESSES

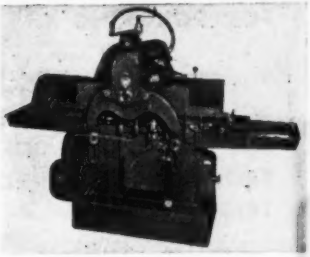
Caldwell 200 tons Horiz. Hydr. Wheel Press.
Niles Bement & Pond Horiz. Hydraulic Wheel Press.
Bliss #18, #20, #20B, #21 O.B.I. Motorized.
Ferracute #86 Wide Frame, motor driven. 61½" between housings. 13⅜" stroke.
Michigan O.B.I. 36 tons cap. 2" stroke. Wide Ram, wide Bed. Motor driven
Bliss No. 68C Dbl. Action, Gap Frame.
Lucas 15 tons, Power Arbor Press. M. Dr.
McCall No. 4 O.B.I. 2½" stroke, 25 tons.
NEW Johnson O.B.I. Presses. All sizes.
Bliss #305 Geared S.S. Single Action
Nilson 56 tons S.S. Dbl. Crank 3-Die Transfer Press
Rousselle #15 Horn Press. Motor Driven

SHEARS

Bliss #109 Slitter, 10 ga. cap. Motorized
Pexto #571 Slitter, 3/16" cap. Motorized
Wais & Roos 10'x¼, 15' gap. Motorized
NEW Famco 36"x18 ga. Squaring
Niagara #152 Squaring Shear. Cap. 52½"x18 ga Motor driven. Front gauges.

GEAR CUTTERS

Fellows #72 High Speed Gear Shaper, Internal & external, Motor driven
Fellows #7 High Speed Gear Shaper, External, Motor driven
Brown & Sharpe #3—36 Automatic Gear Cutter, 36" dia. Motor driven
Barber-Colman #3 Gear Hobber, 5" dia. 7" face, Motor driven
Whiton #1 Automatic Gear Cutter, 34" dia. 7" face, Motor driven
Adams #1 Gear Hobber, 14" dia. 6" face, Motor driven



Cincinnati #2-18 Automatic Horizontal Milling Machine. Late Type, Motor driven with motor and controls. Motor driven coolant system.

MILLING MACHINES

Nichols Head, Late Type, M.D. (six)
Sundstrand #0 Rigidmil, M.D.
Whitney #6 Hand, Cone Drive
Hardinge B.B. Vertical, Bench
Becker #5C Vertical, Cone Dr.
Knight #1½C Vertical
Cincinnati #3 & #4 Vertical. Dial Type
Cincinnati #3, #4, #5 Pl. Horz.
Brown & Sharpe #12 Production. 18" Autom.
Brown & Sharpe #12 Production. 24" Autom.
Brown & Sharpe #0, 1, 1Y Horizontal
Kempsmith #1, #2 Plain Horiz.
Cincinnati 18" Mfg. Plain
Milwaukee #2K Vertical, M. Dr. H. Speed
Milwaukee #3K Vertical, M. Dr. H. Speed
Milwaukee #1½ Dbl. Overarm, Horiz.
Milwaukee #2B Dbl. Overarm, Horiz.
Milwaukee #3B Plain Horizontal
Pratt & Whitney #2 Duplex, Motorized
Cincinnati #0-8 Auto. Horiz. Some w/rise & fall spindle. FIVE AVAILABLE.
Cincinnati #0-8 Vertical. Motor driven. (EIGHT AVAILABLE)

UNIVERSAL MILLING MACHINES

Ames Bench, 12"x3"x7½"
Index #40H, 16"x8½"x16"
B & S #2, 20"x5"x13½"
B & S #1½, 20"x7"x18"
Bridgeport, 20"x9"x16"
B & S #1D, 24"x8"x15"
Garvin #2MU, 24"x8"x18"
K & T "Milwaukee" #2, 28"x10"x17"
Kempsmith #2, 28"x8½"x18"
Cincinnati #2, 28"x10"x18"
Cincinnati #2M, 28"x10"x18"
B & S #3, 34"x10"x21"
Cincinnati #3S, 34"x12"x20"
Some w/index heads & equipment

SHAPERS

Shaper—Columbia 32" B.G. Crank, motorized Power downfeed to head.
Shaper—Logan 7" Horizontal. NEW
Shaper—Machinery Sales 16", motorized
Shaper—Gould & Eberhardt 16", motorized
Shaper—Smith & Mills 16", motorized
Shaper—Smith & Mills 16" Universal
Shaper—Gould & Eberhardt 18" B.G. Crank
NEW—Gemco 20" Universal Shaper. M. Dr.
Shaper—American 24" crank, motorized
Planer—Shaper—Niles-B. Pond 20x20x24

DRILLING MACHINES

Cinci-Bickford 6' Arm, 15" col. Radial
Cinci-Bickford 5' Arm, 13" col. Radial
Fosdick 5" Arm 14" col. Radial
American 4' Triple Purpose Radial, M. Dr.
Cinci-Bickford 3' Arm, 9" Col. Radial. Motor driven. W/table. 12 Speed gearbox.
Walker-Turner 30" Ball-Bearing Radial Drill. ½ h.p. 3/60/220/440 volts motor drive. Tilting Head and Swivel Arm. Universal Machine. Complete with steel bench.
Minster #2D Single Spindle Upright Heavy Duty 2½" cap. Compound Table. Motorized
Buffalo Forge #2MS Drill. Late Type
Leland-Gifford #2MS, 2-Spindle Upright
NEW Buffalo Forge #15, #18 Single Spdles.

EMERMAN OFFERS FROM STOCK

#24 GLEASON STRAIGHT BEVEL GEAR GENERATOR.

•

FOR ROUGHING ONLY

•

35" PITCH DIA.—1½ D.P. PUSH BUTTON CONTROL WITH ALL ELECTRICAL EQUIP.

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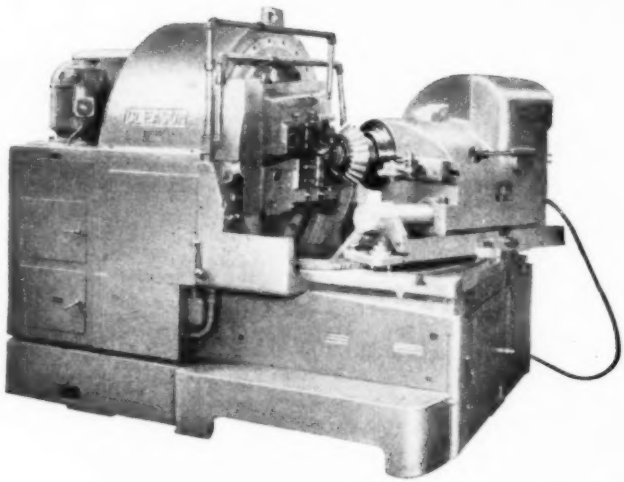
EXCELLENT CONDITION



EMERMAN MACHINERY CORP.

875 W. 120th St.
Chicago 43, Ill.

ROLLS—BENDING—Hilles & Jones 30"x¾" Pyramid Top Roll 30", Bottom Rolls 20", Motors 75 & 45 HP, 3/60/220-440 controls, Wt. 120 Ton

ROLLS—BENDING—Cleveland #2A, 10'x½", Pyramid Type, Drop End, 20 H.P.

(2) **AUTOMATICS**—National Acme 1⅝" cap. 4 spindles, bar feeds, tooling, motors. (Age 1935) BARGAIN

IRONWORKER—Combination Punch & Shear, Coking, Angles 6"x6"x⅝", Rounds 1⅝", Sqs. 1⅜", Motor, Machine Ser. #516F

PLANER—Niles Bamont Pond, Working Bed 48"x48"x26" with 4 Heads, 15 HP, DC, 230 volt, variable speeds

SHEAR—Power Sq., Niagara 10'x10G, with 15" gap, front & back gauges, 7½ HP motor, Wt. 12,000 lbs.

SHEAR—Single End, Link Belt, 30" gap, 24" blade x 1¼" cap., 7½ HP motor, Wt. 7 Ton

HAMMER—Drop Forge, Chambersburg 35,000 lb. cap., like new, air or steam operated, Height 24', Weight 525 Ton

UPSETTER—Horiz. Forging, Ajax #2½", Mtr 15 HP, Wt. 15 Ton, approx.

SHEAR—NEW, Barth 52"x14 G. Motor, front & back gauges, no gap. Sells for $1200.00. Our price $1000.00

PLATE PLANER—Hilles & Jones, 30'x2" cap. Pneumatic Hold-downs, one head, 5" diameter lead screw, 30 HP, 3/60/220 motor worm drive

WIRE STRANDERS—(1943) Two—Robinson 8"x7 spool, reel, motor 7½ HP

LATHE—ENGINE—Bridgeford, Geared Head, Q.C., 32"x21' centers, Motor 35 HP, serial #32,670

LATHE—TOOL ROOM—South Bend, Latest type, 14"x8' overall, actual 16"x36" centers, taper attach, draw bar & collets, motor in base, machine ser. #134977

MILLER—Plain Horiz. Model #4K, K.&T. like new, latest dial type, double overarm, Table 16"x86", power rapid traverse all directions, motor in base, wt. 14,000 lbs.

PRESS-LAKE ERIE—750 Ton, Hydraulic Double Action, Bed 81½"x140", will draw & lift out 22¾", complete, pump & motors 40 HP & 10 HP, controls (1942) Wt. 75 Ton Single or double action

POWER PRESSES

PRESSES	TONS	STROKE	BED—FB, LR	TYPE
(2) Bliss #88	22	5"	12½"x 13½"	C Frame (1943)
(4) Ferracute C22	22	5½"	13½"x 14"	Duplex, 2 Presses on 1 stand (1943) Hopper Feed
(2) L. & J. #3	22	2½"	12½"x 21½"	O.B.I. (1945) Air Safety
(2) Diamond #28	31	3"	13" x 22"	G.E.I. Motor (New)
(1) Torrington	50	2" & 1"	23" x 16"	Sub Arch, Dbl Action, Cam
(1) Toledo #54	60	3"	18" x 18"	SS with side shear
(2) Bliss #6	125	2" & 5"	24" x 32"	SS, dble or single action b.g. (1942)
(1) Clearing F1200-42	200	30"	38" x 44"	SS, Single Action, (1942) b.g.

PRESSES	TONS	STROKE	BED—FB, LR	TYPE
(1) Baldwin-Southwark	250	40"	60" x144"	Hydr, SS, 4-Post
(1) Bliss #78½ (S10)	450	18"	52" x 36"	SS, Single Action, b.g.
(1) Baldwin-Southwark	500	42"	52" x 52"	Hydraulic, 4-Column
(1) Lake Erie	750	up to 46"	81½"x146"	Hydraulic, dbl action Draw 22¾" (1942)
(1) Lake Erie	800	30"	78" x 72"	Hydraulic, 4-Post, SA, (1944)
(1) Lake Erie	1320	up to 36"	48" x 80"	Hydraulic (1942)
(1) Toledo #185	1400	26" & 18"	72" x 72"	Toggle, will draw 13"

MBNA MEMBER

KINGS COUNTY MACHINERY EXCHANGE

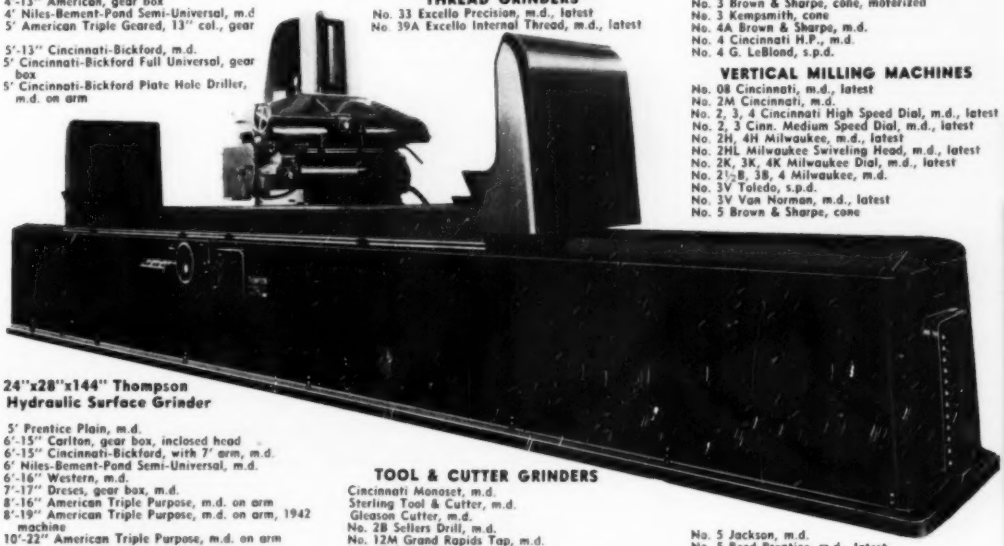
408 Atlantic Ave., Brooklyn 17, N. Y. Phones: TRiangle 5-5237, 5-5212, 5-5213

Eastern For • DEPENDABILITY • SERVICE • QUALITY REBUILDING

• LATE MODEL MACHINES • GUARANTEED EQUIPMENT

RADIAL DRILLS

2' Fosdick, 9" col., gear box
3' American Sensitive, cone
3'-10" Fosdick, gear box
4' American Sensitive, m.d. on arm
4'-11" Carlton, gear box, inclosed head
4'-12" Fosdick, gear box
4'-13" American, gear box
4' Niles-Bement-Pond Semi-Universal, m.d
5' American Triple Geared, 13" col., gear
5'-13" Cincinnati-Bickford, m.d.
5' Cincinnati-Bickford Full Universal, gear box
5' Cincinnati-Bickford Plate Hole Driller, m.d. on arm



24"x28"x144" Thompson Hydraulic Surface Grinder

5' Prentice Plain, m.d.
6'-15" Carlton, gear box, inclosed head
6'-15" Cincinnati-Bickford, with 7' arm, m.d.
6' Niles-Bement-Pond Semi-Universal, m.d.
6'-16" Western, m.d.
7'-17" Dreses, gear box, m.d.
8'-16" American Triple Purpose, m.d. on arm
8'-19" American Triple Purpose, m.d. on arm, 1942 machine
10'-22" American Triple Purpose, m.d. on arm

UPRIGHT DRILLS

20" Barnes All Geared , m.d., tapper
21" Cincinnati-Bickford, m.d., tapper
24" Cincinnati-Bickford, m.d.
30" Rich, H.D., m.d.
D4 Colburn H.D., m.d.
D8 Colburn H.D., m.d.
No. 25 Foote-Burt, m.d.
No. 36HO Baker, H.D., m.d.
No. 217 Baker H.D., s.p.d.

GEAR SHAPERS

No. 6 Fellows, belt drive
No. 7, 7A Fellows, m.d.
No. 18 Fellows Gear Finishing Machine, m.d.
No. 61 Fellows, belted m.d.
No. 61A Fellows, m.d., latest type
No. 64-S Fellows, m.d.
No. 615A Fellows, m.d.
No. 645 Fellows, belt drive
No. 645A3 Fellows, m.d., latest
No. 72 Fellows, m.d., latest

GEAR GRINDERS

9" Pratt & Whitney Hydraulic Spur, m.d.
10" Pratt & Whitney Hydraulic Spur & Helical, m.d.
No. 2HS Lees-Bradner Spur & Helical, m.d.
No. 13LS Fellows Gear Lapper, m.d.

SURFACE GRINDERS

No. 3 Abrasive, m.d.
No. 76 Van Norman Automatic Piston Turning and Grinding Machine, m.d.
Arter Model A-1-8" Rotary, m.d.
No. 11 Blanchard Rotary, m.d., latest
No. 16 Blanchard Rotary, m.d., 26" chuck
18x16x60" Thompson Hydraulic, m.d., late
No. 22—12" Heald Rotary, m.d.
No. 25A—24" Heald Rotary, m.d., latest
No. 25A—16" Heald Rotary, m.d., latest
No. 33 Abrasive Vertical, m.d.
No. 260—16" Heald Rotary, belt
10x12x60" Norton Hydraulic Surface, m.d., latest
14" Pratt & Whitney Vertical, m.d.
22" Pratt & Whitney Vertical, m.d.
24x28x144" Thompson Hydraulic, m.d., latest
54" Bridgeport Knife, belt

THREAD GRINDERS

No. 33 Excello Precision, m.d., latest
No. 39A Excello Internal Thread, m.d., latest

TOOL & CUTTER GRINDERS

Cincinnati Monoset, m.d.
Sterling Tool & Cutter, m.d.
Gleason Cutter, m.d.
No. 2B Sellers Drill, m.d.
No. 12M Grand Rapids Tap, m.d.
No. 4T Sellers Tool, m.d., latest
No. 2 Norton Universal Hydraulic, m.d., latest

MANUFACTURING LATHES

No. 4 LeBlond Boring Lathe, 37' bed, 13" hole
No. 9, 12 LeBlond Multi-Cut, m.d.
31½x36", 31½x80", 4x60", 8x84" LoSwing, m.d.
8x132" LoSwing, m.d., latest
9x12" Sundstrand Mfg., s.p.d.
11x18" LeBlond Rapid Production, m.d.
13"x24" LeBlond Rapid Production, Timken, latest
13"x24" Coulter Automatic Threading, m.d.
13x36" LeBlond Rapid Production, Timken, latest
13x48" Coulter Automatic Threading, m.d.
16"x6' LeBlond Rapid Production, m.d.
17"x6' LeBlond Automobile Mfg., cone
17"x8' LeBlond Rapid Production, m.d.
17"x8' LeBlond Automatic Mfg., m.d.
20"x8' LeBlond Mfg., m.d.
Niles-Bement-Pond Quartering Machine, m.d., new
Schauer Type NA 2B Speed Lathe, m.d.

PLAIN MILLING MACHINES

No. 000 Brown & Sharpe, m.d., latest
No. 1A Milwaukee, m.d.
No. 1M Cincinnati, m.d.
No. 1½, 2, 3 Cincinnati, cone
No. 2B Brown & Sharpe, m.d., latest
No. 2 Cincinnati H.S. Dial, m.d., latest
No. 2 Rockford, m.d.
No. 2HL Milwaukee, m.d., latest
No. 2MH Cincinnati, m.d., latest
No. 3B Brown & Sharpe, m.d., late
No. 3 Cincinnati, Cone
No. 3, 4 Kempsmith Plain Maxi-Miller, m.d.
No. 3B Milwaukee, m.d.
No. 3 Van Norman Duplex, s.p.d.
No. 4 Cincinnati H.P., m.d.
No. 4 Ohio, cone
No. 5 Cincinnati, rect. overarm, m.d.
No. 5 H.D. LeBlond, s.p.d.
No. 5B Heavy Brown & Sharpe, m.d.
No. 25 Becker, cone

UNIVERSAL MILLING MACHINES

No. 2 Cincinnati, cone
No. 2 Cincinnati Medium Speed Dial, m.d., latest
No. 2M Cincinnati, m.d.
No. 2 Kempsmith, cone
No. 3 Brown & Sharpe, cone, motorized
No. 3 Kempsmith, cone
No. 4A Brown & Sharpe, m.d.
No. 4 Cincinnati H.P., m.d.
No. 4 G. LeBlond, s.p.d.

VERTICAL MILLING MACHINES

No. 08 Cincinnati, m.d., latest
No. 2M Cincinnati, m.d.
No. 2, 3, 4 Cincinnati High Speed Dial, m.d., latest
No. 2, 3 Cinn. Medium Speed Dial, m.d., latest
No. 2H, 4H Milwaukee, m.d., latest
No. 2HL Milwaukee Swiveling Head, m.d., latest
No. 2K, 3K, 4K Milwaukee Dial, m.d., latest
No. 2½B, 3B, 4 Milwaukee, m.d.
No. 3V Toledo, s.p.d.
No. 3V Van Norman, m.d., latest
No. 5 Brown & Sharpe, cone
No. 5 Jackson, m.d.
No. 5 Reed-Prentice, m.d., latest
No. 6 Becker, cone
Cincinnati Hydromatic, m.d., 2 spindles

HAND MILLING MACHINES

No. 1 Kent-Owens, m.d.
Atlas Model MF Bench, m.d.
No. 1 Standard, m.d.
No. 2 Productomatic, m.d.
No. 3 Garvin, m.d.

PLANERS

P10 Coulter Crank Type Shaper-Planer, 1 hd., m.d.
20"x20"x5' Whitcomb-Blaisdell Planer, belted m.d., 1 head
24"x24"x10' Whitcomb-Blaisdell, 2 heads, m.d.
30"x30"x10' Gray, 2 heads, belt
30"x30'x14' Gray, 2 heads, belt
32"x32"x16' Gray, 2 heads, belt
36"x36"x10' Cinn., 2 rail, 1 side hd., belted m.d.
36"x36"x10' Niles, 2 heads, belt
36"x36"x18' Niles-Bement-Pond, 2 heads, reversing m.d.
36"x36"x20' Cincinnati, 2 heads, belt
36"x36"x20' Gray, 2 heads, belt
38"x38"x20' Gray Spiral Drive, 2 heads, belt
42"x42"x26' Gray, 2 heads, belted m.d.
48"x48"x12' Gray Openside, 1 rail, 1 side head, reversing m.d.
48"x48"x18' Detrick & Harvey, 4 heads, reversing m.d.
48"x48"x28' Cincinnati, 4 heads, reversing m.d.
48"x48"x30' Cincinnati, 4 heads, m.d.
48"x48"x32' Niles-B-Pond, 4 heads, reversing m.d.
48"x48"x40' Sellers, 2 heads, reversing m.d.
62"x62"x40' Cincinnati, 4 heads, reversing m.d.
66"x60"x40' Niles-B-Pond, 4 heads, reversing m.d.
72"x72"x36' Niles, 4 heads, reversing m.d.
96"x72"x18' Pond, 4 heads, belted m.d.

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LATEST TYPE NEARLY NEW MACHINES

BORING MILLS—Horizontal
CINCINNATI GILBERT 3½" bar, floor type, latest
DEFIANCE #26, 4½" Bar Table Type, Latest
DETRICK & HARVEY 4" bar, Floor Type, M.D.
GIDDINGS & LEWIS #45, 5" Bar Table Type, M.D.
LUCAS #41, 3" bar, Table type, latest type
NILES BEMENT POND 5", 6", 8" bar, floor type
UNIVERSAL 3" bar, high speed, Table type, latest type

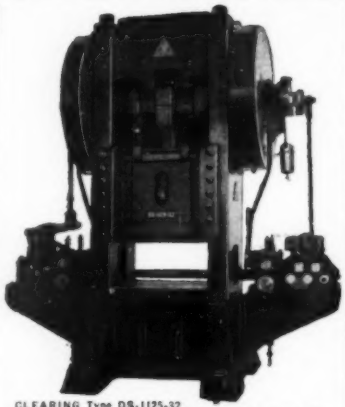
BORING MILLS—Vertical
BETTS 120", 2 swivel heads, AC, Motor Drive
BULLARD 16", 6 spindle Multiamatic, Latest Type
BULLARD 36" Vertical Turret, Spiral Drive, Latest
BULLARD 61" "Mult-Matic," 2 heads, Motor Drive
COLBURN 72", 2 swivel heads, PRT, M.D.
KING 62", 2 swivel heads, PRT, M.D.
NILES 100", 2 swivel heads, PRT, DC, M.D.

GEAR CUTTING EQUIPMENT
FELLOWS #6I, #7A, #7B, #7S, #7T High Speed Gear Shapers, latest type
FELLOWS #Z, #6Z2, Gear Shaper, High Speed, latest
GLEASON 3", 12" straight bevel generator, Latest Type
GOULD & EBERHARDT #12H, #12HS Hobber Latest
GOULD & EBERHARDT 26H Hobber with diff. MD

GRINDERS—Cyl.—Plain & Univ.
BROWN & SHARPE #1, 2, & 3 Universal, Latest
BROWN & SHARPE #20 10 x 18 plain, latest type
LANDIS 4x12, 6x18, Type H Plain Hyd. Latest
NORTON 14" x 30" Type C Plain, Hyd., Latest
NORTON 6x18", 6x30", 10x72", Type C, Plain, latest

GRINDERS—Internal
BRYANT #16-CP-16, #24 Hydraulic, latest type
HEALD 72A3, 72A5 "Gagematic," Internal, Latest
HEALD 75A, 72A3, 72A5, 74, 70A Internal, latest

LATHES—Engine & Mfg.
AMERICAN 36"x360" centers, 2 carriages motor drive
JONES & LAMSON "Fay" 20x25" automatic, latest
LEHMANN 16x30" centers, TIMKEN, latest type
LoSWING 1x60, 4x84, 8x60, 8x108, 8x34, Latest
MONARCH 22"x456" centers, 3 carriage, Timken Bearing, motor drive



CLEARING Type DS-1125-32
Double Action Pre s—Capacity—Inner slide—125 tons. outer slide—75 tons. 5" stroke; with scrap cutter, Littell #6 roll feed. Tie rod construction. Latest Type.

MONARCH 16x78" Centers Timken, latest
NILES 30x50" Boring, Timken, Latest Type
PRATT & WHITNEY 16"x60" centers, taper att., M.D
PUTNAM 42"x25' Centers, Motor Drive
SPRINGFIELD 16"x30" centers, Timken, latest type
WARD, HAGGAS & SMITH—18/30x60" centers gap.

LATHES—Turret
BARDON & OLIVER #5, #7, TIMKEN, Latest Type
FOSTER #4FU "Fastermatic," Timken, Latest
GISHOLT #1L, #2L, Universal, Timken, Latest
GISHOLT #3, #4, Univ., TIMKEN, Latest Type
JONES & LAMSON #3, #5, Univ. Timken, Latest
LeBLEY "International" 1-H5, Univ. Timken, Latest
MOREY No. 2G, No. 3, No. 4, Timken Bearing, latest
WARNER & SWASEY #2A Universal, Timken, Bar & Chucking, Latest Type (Preselector)
WARNER & SWASEY #1, 2, 3 Ram Timken, latest

MILLING MACHINES—Mfg.
INGERSOLL 42"x8"x12" adj. rail, 4 heads, AC, M.D.
INGERSOLL 32x24x16" Planer Type 2 heads, AC, M.D.
INGERSOLL 30x24x12" adj. rail slab, M.D.
SUNDSTRAND Model 3A Duplex 42" feed, Latest

SCREW MACHINES—Automatic
BROWN & SHARPE #2G, 1¼" cap., Latest
CONOMATIC 2⅝"—6 spindle, Latest Type
CONOMATIC 6" 6 Spindle, Latest type
GOSS & DeLEEUW 8" Automatic Chucker, 5 spindle

MISCELLANEOUS
AJAX 1½", 2", 3½", Forging and Upsetting, M.D.
BARNES #17S, 200H, 30T Vertical Hone, Hydraulic Self-Oiling, Latest Type
CINCINNATI 1-48, 3-30 Duplex Vert. Broach, Double Ram, Model ER Hyd., Latest type
LAKE ERIE 500 ton Vertical Hydraulic Press, latest
MICHIGAN #1708A Cutter Reliever, Latest Type
PRATT & WHITNEY (KELLER) Type BL-2416 Copying, latest type
PRATT & WHITNEY ½Rx50 Rifler, Latest Type
QUICKWORK ⅝" x 1" cap. Rotary Shear—M.D.

AVAILABLE FOR PROMPT SHIPMENT

MOST BUILT AFTER 1941

(Partial List) Over 2,000 Machine Tools in Stock. Your Inquiries Are Invited . . . Prompt Service Is Assured

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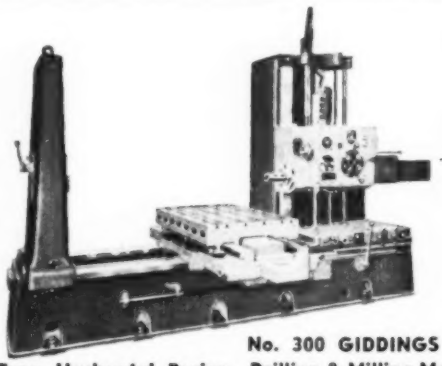

On Original Skids.

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Never Used.

IMMEDIATE DELIVERY!

No. 300 GIDDINGS & LEWIS Table Type Horizontal Boring, Drilling & Milling Machine.

3" Dia. Spindle—24" Travel
36 Spindle Speeds 22-1600 RPM
Table 24" x 42"" with 30" Crossfeed
36" Headstock Travel
72" Spindle to End Support
220/3/60 AC Elec. Equipment
Pendant Control

WIRE WRITE PHONE

WIGGLESWORTH MACHINERY CO.
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NEW SURPLUS

SURFACE PLATES
12"x18", Hand Scraped, with Handles, Cover. Weight 70 lbs. PRICE: $29.50 each.

SURFACE PLATES
10"x14". Ground on All Sides, One Side Surface Plate, Reverse Side Lapping Plate. Weight 50 Lbs. PRICE: $15.00 each.

12" COMBINATION SQUARES
With Bevel Protractors Complete, Union. PRICE: $5.50 each.

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Sheffield No. 108 Thread Grinder, 1944
National Acme Thread Roller, 1948
No. 1F Foster Fastermatic, turret type
No. 13 B S Universal Grinder, M.D.

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47 Lauralton Rd., Rochester 9, N. Y.

2—Lodge & Shipley Duematic lathes
2—Potter & Johnston #5 DE Chucking machines
1—D. E. Whiton #16 gear cutter
1—Monarch Lathe, 22 x 48"
1—3 spindle Gould & Eberhardt spur gear and bevel rougher
1—Heald double spindle Barematic

SIER-BATH GEAR & PUMP CO., INC.
9252 Hudson Boulevard, North Bergen, N. J.

LATE TYPE MACHINERY AT OLD TIME PRICES

AUTOMATICS

Brown & Sharpe #00G, H.S. (8) #4, #6
Conomatic 8 sp. 1⅞" cap.

BORING MILLS

Giddings & Lewis #9, #25T, #45
Lucas #31 horiz.
Universal 3" horiz. equipped
Bullard 24", 42" New Era V.T.L.

DRILLS AND RADIALS

Buffalo 18", 1" capacity
Cincl-Bickford Sup. Ser. 21", 24".
Delta Bench & Floor Models single & 4 spindle
Royersford Excelsior 21" B.G.
Natco Model E-5 Multi-Spindle
American Hole Wizard 3'-9" col., 4'-11" col.
Canedy-Otto 3'-9" col.
Carlton 8'-10" col.
Sibley 24—28" Latest

ENGRAVERS

Gorton #3U, 3Z, 2 dimensional Model ME
Gorton #3L, 3 dimensional
Gorton Cutter Grinders

GEAR EQUIPMENT

Fellows #72, 725 High Speed
Mikron Gear Hobber
National Broach Checker and lead comparator

GRINDERS—Miscellaneous

Brown & Sharpe #5 cyl.
Brown & Sharpe #2, #3 Univ.
Brown & Sharpe #13 Univ. & Tool
Cincinnati #2 Centerless Fillmatic, 12"x36 Univ.
Covel #91A Univ. Tool & Cutter
Excello #44 Carbide, Hammond #4
Gardner #226, 36 disc.
Heald Tool
K.O. Lee Tool & Cutter
Landis #4H Cyl. 4x12"
Landis #6 Thread & Centerless
Norton #2 Tool & Cutter
Norton Cyl. 6x18" Type C, 6x30" Type C
Oliver #510 Drill Pointer, Sellers #4G
Pratt & Whitney Radius #R6
Black Diamond #1 Drill
Porter Cable Belt WG8, G8

GRINDERS—Surface

Abrasive #1½" Wet Hand Feed, #34 Vertical
Atlantic 6x18" Power Feed
Brown & Sharpe #2 P.F., #5 Hyd. 8x24" Cap.
G. & L. #16, 6x18" Hand Feed, #25, #36 Hyd.
Hanchett #300, 13x48"
Mattison 14x16x48" Hyd.
Norton 6x18" Hyd.
Reid #2A P.F. MIB, #2C Pope Spdl Hand
Pratt & Whitney 12x36" Vert.
Thompson Hyd. 6x10x18", 6x12x18

LATHES

Hardinge Precision 9"
Hendey G.H. 12x30"
LoBlond Regal 16"x3½", 15x30", 19x42", 21x60"
LoBlond Heavy Duty 16x30"
Lodge & Shipley 16x78" T.A.
Logan 10"x30"
Monarch 10"x20" EE, 16x78" T.A.
Rivett Precision
Sebastian 12"x4' G.H., Sheldon 11x24", 1" collet
South Bend 9"x3' L.C.G., 9"x3½' Q.C.G.
South Bend 10" Toolroom 1" collet capacity, T.A.
South Bend 13x36", 16"x7'

MILLS—Plain & Universal

Brown & Sharpe #2 (3)
Burke #4 Plain & Univ. Vert. Hd.
Cincinnati #3 Plain
Milwaukee #2HL, 2H Plain
Milwaukee #2H, 3H Univ.
Van Norman #12, 26, 36

MILLS—Vertical

Bridgeport, Slotting Attach.
Brown & Sharpe #2 (39)
Cincinnati #4 Dial Type
Kearney & Trecker #5H
Gorton #8D, 9J Plain
Gorton #8½D, 9J Duplicator Fully Equipped
Fosdick Jig Borer #30A Like New
Sip Jig Borer #MP-5
Morey #12M Profiler 2 sp.—Pratt & Whitney 12B

MILLS—Production

Brown & Sharpe #000, 12, 2I
Cincinnati #1-12, 2-18 Mfg.
Kent Owens #1V, 2-2B
Nichols Hand, Vert. Hd.
Van Norman Production

PRESSES

Bliss #8 Dbl. Crank, Bed 42x100"
Bliss #675 Hi-Production
Bliss #21 O.B.I.
Bliss #58 O.B. Gap Frame #62, 62A, 162 SS
Bliss #4½ Double Action Cam
Diamond #31 O.B.I.
General Flexible Elec. Screw
Henry & Wright 25, 60, 75 Ton Dieing
Thomas 90 Ton O.B.I.
Toledo 400 Ton Knuckle Joint #603
V. & O. #25S O.B.I., #102 Reducing
Z & H 30 Ton O.B.I.

NEW IN STOCK

Air Hydraulic Presses
Arbor Presses #6C Famco, ⅓ under list price
Band Saws Kalamazoo 8x10", 8x24"
Drill Presses all sizes
Grinder Surface, Abrasive #1½
Hydraulic Press Northern 20 Ton
Injection Molders, 1 ounce
Power Presses, Famco 4½, 7½ Ton
Power Presses, Rousselle O.B.I. & Horn
Power Presses Presarita OBI, 5, 10, 12, 18, 30 ton cap.
Shaper, 7" Ameo, 8" Shaprite
Shaper, Sheldon 12"
Shears, Foot 22" to 8', 16 & 18 ga.
Shears, Power, 3'x18 gauge to 10'x10 ga.
Welders, Arc. Seam, Spot all sizes
Vert. Milling Attach. Halco, HS 5 & 10 Speed
Motors, Grinders, Buffers, all sizes

HYDRAULIC EQUIPMENT

500 TON LAKE ERIE PRESS

Platen 35"x36", 36" stroke, 68" opening, 150 H.P. 220-440 V. Motor.
600 Ton Baldwin South. Platens 76"x58, Stroke 22", Opening 36".
500 Ton H.P.M. Double Action with 166 ton cushion. Platen 36"x36", Stroke 24", Opening 36".
1000 Ton French-Oil Bed 53x42", stroke 20" daylight 56".
Brand New 300 ton Watson-Stillman Hobbing Press & Pump.
375 Ton ELMES Double Action, with 60 ton cushion. Platen 84"x44", 12" Stroke, 42" Opening.

350 TON VERSON PRESS

40x40 Platen, 36" stroke, 72" opening, 100 H.P. 3 phase—60 cycle 440 volt.
150 Ton Double Action Press with 40 Ton Clamping cylinder & Plate Bed 84x30 Stroke 30", Opening 24" to 48"

400 & 500 TON SHAFT STRAIGHTENERS, Self Contained

All Hydraulic equipment is completely engineered and checked by a competent staff, thus assuring reliability. Send us your hydraulic problems.

LATHES—Turret

Acme #6W Bar & Chuck
Gardens & Oliver #3, #5
Brown & Sharpe #1, 2F, Hand Screw Mach.
Foster #3B
Gisholt #4, 5 Bar & Chuck
Hardinge ESM Second Operation
Jones & Lamson #8A Univ. Saddle Type
Oster #601 Rapiduction, Morey #3, 1½" cap.
Warner & Swasey #3 Universal, #4 Pre-Selector, Air Chuck

MISCELLANEOUS

BAND SAW; Doall #V26
BAND SAW; Tannewitz #36M
BENDING ROLL; Buffalo #0
EYELETTER; Peerless #226
FILER; Oliver, HEAVY DUTY
HACKSAW; Marvel #4B
HACKSAW; Marvel #6A Automatic
HARDNESS TESTER; Clark
HAMMER; Niles Bement Pond 2500 lbs. steam
HAMMERS; Rochester Rivetting
HONER; Micromatic #H-1
INJECTION MOLDER; Reed-Prentice #10DG, 6 ounce
IRONWORKER; Buffalo 25UD
KEYSEATER; Davis #4
PLASTIC GRINDER, Ball & Jewel
PRESS BRAKE; #253, #335 Chicago
ROUTER; Onsrud #W240
SHAPER; 8" Shaprite
SHEAR; Pexto, 6'x14 Ga. Power
SHEAR THROATLESS; #138 Lenox
SPEED LATHES; Cincinnati, Schauer
TAPPERS; Bakewell #1
TAPPERS; Haskins #2C, 3C
THREAD ROLLER; Waterbury-Farrel #30 with Dies.
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WELDERS SPOT; Taylor-Winfield 50 KVA
WELDERS SPOT; Sciaky

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Avey & Allen 3, 4, 5, & 6 Spindles
Fox M.D. Type 138C Multi Spdl. Late
Cincinnati-Bickford 3', 4', 5' & 6' Radials
Niles-Bement & Pond 6' Radial
Barnes No. 2—4 Spd. M.D. Hydram Late

GRINDERS

Norton 6"x10"x36" Surface
Norton 15"x17"x72" Surface
B. & S. Nos. 1, 2, 3, 4 Universal
Bryant Nos. 3B, 6 & 12 Internal
Cincinnati No. 2 & No. 3 Centerless
Cincinnati No. 3 Centerless Lapper
Blanchard No. 16—26" & 16A
Blanchard No. 16—30 Vert. Late
Heald No. 22—12", 16" Rotary Surface
Abrasive Nos. 33, 3 & 34 Surface
Heald Nos. 70A & 72A Internal
P. & W. 14" Vert. B. B., M.D.
Norton Type "C" 6"x18" M.D. Hyd. Cyl.
Norton 10"x24" M.D. Plain Cyl.
Landis "H" 4"x18" Plain Late

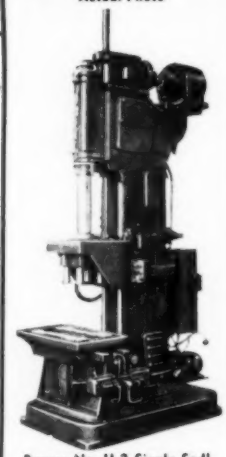
LATHES

Johnson 36"x36' B.G.L.C.G. Engine
Monarch 12"x30" CK (swings 18")
Monarch 12" Ck 14"x30" M.D. G.H.Q.C.G.
Hendey Plain 12", 14", 16", 18" Yoke Head
Hendey 24"x8' M.D. Q.C.G. Eng.
Hendey 12"x5' M.D. Geared Head
American 30"x25' G.H. M.D. Q.C..G.. Eng.
American 30"x16' G.H. M.D. Q.C.G. Eng.
Lodge & Shipley 36"x16' M.D. G.H. Q.C.G.

MILLERS

K & T 2H D.O. M.D. Pl. Late
K & T 2H Vert. M.D. Sliding Hd. Late
Pratt & Whitney Keller Type BL-2416 Semi-Auto. Duplicator
K. & T. No. 2HL, No. 4H Plain
Milw. No. 3B Univ. D.O.
Cin. Nos. 2 & 3 Vert.
Van Norman No. 3SP Plain
Van Norman Nos. 0, 10 & 11 Duplex
P. & W. 8", 10" & 12" Auto.
P. & W. 6"x80" M.D. Thread
Cinn. No. 3 M.D. Plain
Gorton No. 9J Vert. Late

Actual Photo



Barnes No. H-2 Single Spdl. Hydram Prod. Drill, with 4 Spdl. Multi-Spdl. Head

B. & S. No. 21 Plain Auto.
Kempsmith No. 2G Plain Late
Kempsmith No. 4, Plain Max. Late

SHAPERS

Cincinnati 24" M.D. Crank Late
Hendey 32" M.D. Crank Late
Gould & Eberhardt 24" Crank
Gould & Eberhardt 16" M.D. Crank

PRESSES

Verson 500 Ton M.D. Twin-Geared S.S.
Bliss No. 52 2¼" Stroke B.G. M.D. S.S.
Bliss No. 5½-42 M.D. S.S. double crank
Bliss No. 304 M.D. S.S. Single Crank
Bliss No 703 M.D. Flat Edge Trimming
Bliss No. 21 O.B.I. Power

SCREW MACHINES

B & S Late Type 00G, 0G & 2G Auto.
B & S. Nos. 00, 0, 2 Automatic
B. & S. Nos. 1 & 2 Hand
Gridley ⅞", 1¼", 1¾" & 2⅝" Model G
Cone 1¼", 3¼", 3½" & 4¾"—4 Spindle
J & L ±5 M.D. Univ. Ram Type Turret
Foster No. 7 & 7B
W. & S. Nos. 1, 2, 2A, 3A Univ.

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3 ton American vertical
No. 1 Foote Burt duplex surface
9 ton American horiz. surface
Twin 10 Oilgear duplex
No. 3XA Oilgear
30 ton No. V48 American vertical
No. 3 Lapointe screw type

RADIAL DRILLS

3' Morris
4' Hammond elbow arm
4' Cint. Bickford universal
6' Dreses
6' Cincinnati Bickford
7' American triple purpose

GEAR CUTTERS

Nos. 3, 12 & Type T Barber Colman
Nos. 8H, 12H & 16 HS Gould & Eberhardt
No. 130 Cleveland Rigidhobber
Nos. 1, 5A & 5AC Lees Bradner
No. 5M Adams Mfg. hobber
12" Reed Ring gear shaver
8" Red Ring gear lapper
18" Gleason bevel tester & lapper
24" Flather auto. spur
No. 6 Fellows gear shaper
Cimatool gear chamferer

GRINDERS

Nos. 1 & 2 Brown & Sharpe universal
6"x18", No. 10 B. & S. Elec. hydraulic
10"x18" & 14"x36" Landis hydraulic
10"x36" & 23"x36" Norton hydraulic
Nos. 10 & 16 Blanchard rotary surface
12" & 16" No. 22 Heald rotary surface
16" & 24" No. 25A Heald rotary surface
10x24 Norton hydraulic surface
12"x48" Thompson hydr. surface
14"x60" Mattison hydr. surface
53", No. 372 Gardner horiz. disc
No. 115 Gardner opposed disc
30", No. 230 Hanchett opposed disc
Nos. 72A3 & 72A5 Heald internal
No. 16A16 & 24-36 Bryant internal
No. 2 Cincinnati centerless
Nos. 33 & 35 Excello thread
No. 2 Norton tool & cutter

LATHES, TURRET

No. 2 FU Foster Fastermatic
24" & 42" Bullard vertical
Nos. 2, 3, 4, 1A & 3A Warner Swasey
Nos. 4 & 3AL Gisholt
Nos. 5, 2 Denver universal
Nos. 2G & 3 Morey
No. 601 DD Oster
Nos. 5 & 7 Bardons & Oliver

MILLERS, MFG.

24" & 48" Cincinnati duplex
No. 3—36 Cincinnati Hydromatic duplex
No. 18-36 Kearney & Trecker duplex
Nos. 1-12, 1-18, 2-18 & 2-24 Cincinnati automatic
Nos. 3-24, 4-36, 4-38, 5-80, 58-72 & 58-90 Cincinnati Hydromatic
Nos. M18, M24 & 12-24 Kearney & Trecker
Nos. 1, 1M & 3 Kent Owens
30", 42" & 84" Ingersoll Rotary
No. 00 Cincinnati, horiz. vertical or rise & fall
Nos. 4, 40 & CT36 Lees Bradner thread
Types C & D Hall Planetary

PRESSES

No. 2½ Toledo OBI
Nos. PA4 & CA4 Ferracute horning
Nos. 1½ & 1½C Bliss cam drawing
42", No. 90E Toledo double crank
Nos. 304 & 75½ Bliss straight side
No. 56 Toledo straight side
350 ton Clearing No. F1350-42
600 ton Hamilton No. 2216½
700 ton No. 7C Ajax forging
75 ton Southwark hydraulic
300 ton French Oil hydraulic
500 ton Clearing hydraulic

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SAGINAW, MICH.

LATE TYPE MACHINES

5' - 13" Cincinnati - Bickford Super - Service Radial
24" Cincinnati-Bickford Super-Service Upright Drill
#3H Milwaukee Plain Miller
#1-18 Cincinnati Production Millers
#3MS Cincinnati Plain Miller
#174 Heald Internal Grinder with gap to swing 54"
#18-Y-28 Bryant Internal Grinder
10"x48" Norton "C" Grinder, oscillating wheelhead
#2 Cincinnati Filmatic Centerless Grinder

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Waterbury-Farrel Fdry. ⅝" and 1" D.S. S.D. Cold Headers, also Thread Rollers.

Fisher 5" Bar, Floor Type Boring Mill. New in 1942.

Niles, Bement, Pond 60"x60"x24' table 4-Head Planer, Rev. D.C. M.D.

Bliss Presses in all sizes up to 1,000 ton capacity.

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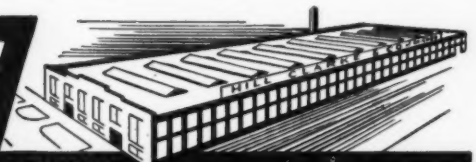
HILL-CLARKE MACHINERY COMPANY



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1⅛" Greenlee, 6 Spdls. (1941)
No. 61 New Britain 6 Spdls. 1⅝" (1942)
No. 6 Brown & Sharpe
No. 49 New Britain, 4 Spdl. chucker
Model A 2½ Cleveland

DRILLS

No. 150 Baker
No. 314A Baker
No. D6 Colburn No. 6 Morse Taper
No. 1LMS—20"—5 Spdl. Leland Gifford
No. 2LMS—26"—1 Spdl. Leland-Gifford
No. 2LMS—14"—3 Spdl. Leland-Gifford
No. 2LMS—28"—4 Spdl. Leland-Gifford
No. 3LMS—28"—6 Spdl. Leland-Gifford
No. 3B—24"—6 Spdl. Edlund (1942)
No. 4BL Natco 36 Spdls.
6'-17" Col. Fosdick Radial
7'-15" Col. American Full Universal

GEAR MACHINES

No. 61-A Fellows Gear Shaper
No. 7125 Fellows (1943)
No. 712 Fellows Auto Indexing (1943)
No. 72 Fellows Gear Shaper
No. 16 HS Gould & Eberhardt
No. 18H Gould & Eberhardt
No. 6 Gleason Gear Tester
12" Gleason Bevel Gear Cutter
72" Cincinnati Gear Cutter

HORIZONTAL BORING MILLS

No. 31 Lucas, 3" bar
No. 46 B Heald Bore-Matic
No. 112—C Excello 2 Spdl.

GRINDERS

3"x12" Brown & Sharpe No. 5
4"x12" Landis, Model H (1942)
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"x18" Norton Type C Plain (1943)
10"x14"x36" Norton Type C Plain (1942)
10"x48" Norton Type C Plain (1943)
Norton Motorized Grinders
6"x18" —— to —— 24"x240"

No. 5—8"x24" Covel Hydr. Surf. (1941)
No. 25A—24" Heald Rotary Surface (1943)
No. 36-A Hanchett Rotary Surface

FOR YOUR PROTECTION ONLY HILL-CLARKE OFFERS YOU THIS 5 WAY GUARANTEE

1. A responsible organization—82 years experience.
2. Modern machines — no worn out equipment.
3. Every machine remanufactured or carefully inspected by experienced craftsmen.
4. You can see your machine tested under power.
5. Hill-Clarke's unconditional money-back guarantee.

72A-3 Heald Internal Grinder (1942)
72A-5 Heald Internal Grinder (1942)
74 Heald Internal Gdr. (1942)
No. 5 Bryant Internal Grinder (1942)
No. 18-16 Bryant Internal Gdr. (1942)
No. 18-30 Bryant Internal Grinder (1942)
No. 24-26 Bryant Internal Grinder (1941)

LATHES

15"x5' Sebastian, Grd. Head
16"x54" centers LeBlond (1941)
16"x60" centers Pratt & Whitney, Model B
18"x6' American, Grd. Head
19"-38" gap x 10' LeBlond
36"x30' Lodge & Shipley
36"—48"x16' Lehman Hydratrol (1945)
48"x20' centers Simmons (1942)
50"x17' centers LeBlond (1942)

LATHES (Production)

8"x15" Sundstrand, Model D (1943)
10"x16" Sundstrand
10"x22" Sundstrand, Model AA (1943)
16"x33" Fay Automatic (1942)
20"x25" Fay Automatics (1942)
R—14 Seneca Falls Lo-Swing

MILLING MACHINES

No. 4 Cincinnati Plain (1943)
No. 2 H Milwaukee Vertical
No. 2 Cincinnati Vert. (1942)
No. 2M Cincinnati Vert. (1941)
No. 3 Cincinnati H.P. Vertical
No. 1-18 Cinn. Mfg. (1940)
No. 2—18" Sundstrand-Electromil (1942)
No. M-24 Milwaukee Simplex (1942)
38"x40"x10' Fitchburg Duplex Miller (1943)
No. 4-48 Cincinnati Hyd. Tracer (1942)
No. 34-48 Cincinnati Hyd. Duplex
No. 45-48 Cinn. Hyd. Plain Tracer (1942)
No. 56-72 Cincinnati Hydro
4"x8" Hanson-Whitney Univ. Thrd. Miller
4½"x12" Pratt & Whitney, Model C
6"x36" Lees-Bradner—Model HT (1943)
6"x48" Pratt & Whitney Thrd. Miller
6"x80" Pratt & Whitney Thread
6"x132" Pratt & Whitney Thread Miller
6"x168" Pratt & Whitney Thread
10"x48" Hanson-Whitney Thread
24"x24"x12' Ingersoll Adj. Rail
36"x36"x16' Ingersoll Slab Miller
No. 10 Ingersoll 72"x6' Travelling Col. Face Millers (1942)

MISCELLANEOUS

18" Dill Slotter
Model H-7 Micromatic Hydro Honer
Model H-2 Micromatic Hydro Honer
Model 200 Micromatic Hydro Honer
8-M Wells Band Saw
Model H-100 Micromatic Hydro Honer
Model 200—HS Micromatic Horiz. Hone.
No. 2 V & O open back press
Baush Radial Tapper (1942)

PLANERS

36"x36"x12' Cincinnati
36"x36"x18' Gray, 4 Heads
48"x36"x14' Gray
48"x48"x12' Cincinnati, 4 Heads

TURRET LATHES

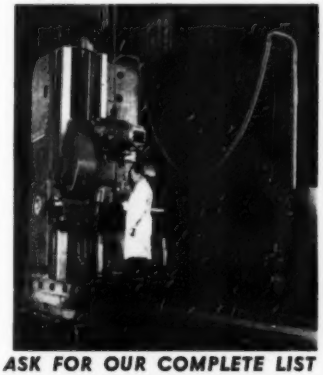
No. 3 Jones & Lamson Bar Feed
No. 4B Libby, Bar Feed
No. 5 Bardons & Oliverrs (1942)
No. 5 Mid'and, Bar Feed
No. 2-A Warner & Swasey
No 1-H Libby, 6¼ Hole in Spindle (1937)
No. 1-H Libby, Extra Long Bed (1942)
18" Libby, 3½" Hole in Spindle
No. 4A Warner & Swasey, 7½" Hole in Spindle
No. H-5 Libby

VERTICAL BORING MILLS

42" Bullard New Era
42" Colburn
60" Colburn
72" Niles Extra Heavy
84" Belts

FEATURE OF THE MONTH

72" x 6' Ingersoll Travelling Column Face Miller which can handle unusually large milling obs. Late model. Outstanding condition. Ready for immediate use. See under power in our plant.



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Colburn 48" Heavy Duty Vertical Boring & Turning Mill, Power Rapid Traverse

Bullard 24" Vertical Turret Lathe, New Era Type, Motor Drive

Cincinnati Nos. 2-36 & 5-42 Duplex Vertical Hydro Broaches

Excello No. 112-C Sr. Diamond Boring Machine, Sgl. and Dbl. Spindle, Late

Barber Colman Type A Gear Hobber, Excellent Condition, M.D.

Gould & Eberhardt Nos. 12-H & 24-H Gear Hobbers, Universal, M.D.

Gleason No. 13 Universal Gear Testers for Spur, Helical & Bevel Gears

Hammond DE Disc Grinders, 18" & 26", Late Type, B.B., Auto Lubrication

Blanchard No. 16 Surface Grinder, 30" Dia. Mag. Chk., 25 hp 220-440 Motor

Abrasive, No. 5 Surface, 14"x14"x48" Capacity, Hydraulic Table Feed

Heald No. 25-A Surface, 26" Diameter Mag. Chuck, Motor Drive

JONES & LAMSON No. TG615 THREAD GRINDER, LATE TYPE, EXCELLENT

EXCELLO No. 35-L THREAD GRINDER, LATE TYPE, REFRIGERATED COOLANT TANK

Brown & Sharpe No. 13 Universal Grinder, Late Type, M.D.

Warner & Swasey No. 1-A Turret Lathe, Timken Bearing, 12-speed Head

Warner &Swasey No. 1-A Turret Lathe, Bar & Chucking, Older but Good

Cincinnati No. 3 Plain Mill, Timken Bearing, MIB, Rectangular Overarm

Cincinnati No. 4 Universal, Timken Bearing, Rect. Overarm, Div. Hds.

Brown & Sharpe No. 3 & Rochkford No. 2B Univ. Mills, Cone & M.D.

HOWARTH Machinery Co.

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Bridgeford 36"x56' Gr. Hd. 48' C.D.
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American 30"x24' Medium Pattern Gr. Hd. 18' C.D.

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Universal #44 Triway 4½" Bar.
Universal 4" Triway 12" Extra Vertical Range.
Yoder 3A, 3" Bar. (like new).
Bullard 24", 36" Spiral Drive.

MILLERS

B.&S. #2 Light Type Univ. (Univ. Milling Attachment).
Van Norman #25U Univ. (attachments).
Cinn. #3S Univ. Rect. Overarm Attachments.
B.&S. #3A Motor in Base Univ.

P.&W. 1½B Jig Borer Ser. M1628-149. Less than 6 mos. use.

GRINDERS

Cin. . #2 Filmatic Bearing Centerless.
Cin. . #3 Centerless.
Mattison 14"x24"x60" High Power Hydraulic Surface.
Gallmeyer & Livingston #5 10"x36" Hyd. Surface.
Gallmeyer & Livingston #45 12"x24" Hyd. Surface.
Blanchard #11 Rotary Surface.

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1/4"x10' MILD STEEL
1/8"x10' STAINLESS STEEL
3/16"x12' MILD STEEL
3/32"x12' STAINLESS STEEL

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Toledo 59, 240 ton straight sided 12" stroke.
Billings & Spencer #2 with side shear 2¾" stroke.

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Metal Forming and Bending Machine #206-F Toledo 155 Ton D.C. Press, 3" Stroke, 20" x 110" Bed Area
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Roller Type Slab Miller 22" Slab capacity
12 Spindle Moline Automatic Drilling Machine
3 spindle Moline Model 7-D Cylinder Borer
1 -A W&S Universal Turret Lathe
36" x 14' Schumacher & Boye Engine Lathe
Libby 20" x 4½" spindle Turret Lathe
#33 ExCello Thread Grinder
Lees Bradner CT 36" Thread Millers
10" x 48" Roll Grinder
300' Air Compressor, Ingersoll Rand, 50 HP Motor Drive.

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3890 BUCHANAN, S.W.
GRAND RAPIDS, MICHIGAN

AUTOMATICS

#0G B & S, late type
1½" & 1⅝" 8 Spdl. Cone, late
9/16", 1", 1¼", 1⅝", 2", 2½", 2⅝" Acme Gridleys, late
2¼ & 2⅝" Cone 6 Spdl., late
12" and 16" 8 Spdl. Bullard Multaumatics, late

PRESSES

2000 ton Bliss Hydr., 3 sel. type, 12" str., 50½" sht. ht., dia. bed 118"
60 ton Dbl. Crank, 5" stroke, 48x24 bed, late model Waterbury Farrel
90 ton Dbl. Crank, 8" stroke, 48x18 bed, late model Bliss
35 ton 4, 5, 6" stroke, latest type, w/all accessories, Bliss $850.00 ea.
70-85 ton 4" stroke 21 x 27 bed, 110 strokes per min., Bliss, latest type
90-125 ton 4½" or 5" stroke, 60, 80, 110 (optional) strokes per min., late type
Inclinable, New, 20 to 70 ton, immediate delivery
375 ton Elmes, 12" stroke, 84x54 bed, late type
350 ton Elmes, 20" stroke, 38x45 bed, late type
250 & 750 Baldwin, 144x48 bed, 48" stroke
#385 Bliss, 12" stroke, late

TURRET LATHES

#3 & #5 Warner & Swasey, late type, lots of tooling
#4FU Fastermatic, 4" cap., late type
#3HB Libby Sliding Bed Gap, 8½" cap., late type

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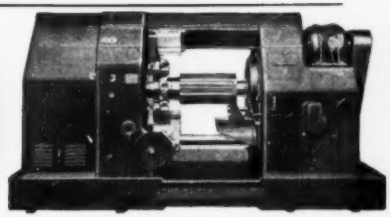

Model RPA-8 6" Acme Gridley Automatic Chucking Machine. Latest Model.

AUTOMATICS
6" RPA-S Acme Gridley Chucker. Late.
6" Goss & DeLeeuw Chcker, 8 spdl. 1943.
9/16" RA-6 Gridley. 1942.
9/16" RA-6 Acme Gridley Chucker. 1942.
1⅝" Greenlee. 1942.
No. 60 New Britain, 6 spindle. 1942.
No. 1½B Cleveland. Late.
Model 3-8 Ceco. Late.

BORING MACHINES
3" Yoder Boring Mill. 1942.
No. 49 Heald "Bore-Matic" Double end. 1942.
No. 49 Heald "Bore-Matic" Single end. 1942.
No. 46B Heald "Bore-Matic". 1940.
No. 47A Heald "Bore-Matic". 1942.
No. 2112A Excello. 1943.

BROACHES
No. SRV 40-66 Lapointe Vertical Surface. 1942.
No. CPC 6-30 LaPointe Vertical. 1941.
48" Oilgear Horizontal.
6 Ton American Vertical. Late.

DRILLS, HEAVY DUTY
25" Fosdick Economax. 1941.
24" Sibley Sliding Head. 1942.
No. 3 Bausch Multiple Spindle.
Fox Multiple Spindle. 1944.
Barnes 2 Spindle Deep Hole. 1943.
No. ⅛ B P & W Deep Hole. Late.
No. ½ B P & W Reamer. Late.
No. ½ B P & W Hyd. Riffer. Late.

DRILLS, RADIAL
6' 17" Carlton. 1942.
Bausch Drill & Tapper. Late.
20" Pfiffner Drillmaster. 1942.

DRILLS, SENSITIVE
20" Walker Turner 6 Spindle. 1942.
No. KH2 Allen, 6 Spindle. 1943.
16" Atlas, 4 Spindle. 1942.
15" Atlas, 4 Spindle. 1942.
14" Delta, 4 Spindle. 1942.
No. 2 Motor Avey, 4 Spindle. 1943.
No. 2 MS Allen, 1 to 3 Spindle. 1942.
No. 2 Motor Avey, 3 Spindle. 1942.
No. 2B-8 Edlund, single spindle. 1942.
No. 2 Hamilton-Muehlmat. 1943.
Leland-Gifford, Single Spindle. 1942.

GEAR EQUIPMENT
3" Gleason Bevel Gear Gen. 1942.
No. 7½ Fellows Gear Shaper. Late.
No. 5S Fellows Gear Lapper. Late.
No. 6 Gleason Tester. Late.
No. 12 Gleason Tool Sharpener. 1942.
Model GCL-8 Red Ring Gear Shaver. 1942.
No. 860B Michigan Gear Shaver. Late.
15" Red Ring Gear Lapper. 1942.
Red Ring Universal Gear Checker. Late.
10" Red Ring Gear Speeder. Late.
Type S Barber-Colman Hobber. 1942.
No. 140 Cleveland Hobber. 1942.
Vinco Spline & Gear Grinder. 1942.
No. 7125A Fellows Gear Shaper. 1943.

GRINDERS, CYLINDRICAL
16"x36" Cincinnati Plain. 1942.
14"x36" Norton Type C Universal. 1943.
12"x48" Cincinnati Universal. 1943.
10"x72" Landis Type C Plain. 1942.
10"x24" Landis Type C Universal. 1942.
10"x18" Norton Type C Plain. 1942.
6"x30" Cincinnati Plain. 1943.
6"x24" Norton Plain. 1936.
6"x18" Landis Type C Plain. 1941.
6"x18" Norton Type C. 1942.
4"x12" Landis Type H Plain. 1942.
No. 5 Brown & Sharpe Plain. Late.
No. 2 & 3 Cincinnati Centerless. 1942.

GRINDERS, INTERNAL
No. 81 Heald "Sizematic". Late.
No. 74 Heald Extended Bridge. 1941.
No. 75A Heald, two motor. 1943.
No. 72A3 Heald Plain. 1942.
No. 72A5 Heald Plain. 1944.
No. 16A22 Bryant Internal. Late.
No. 5 Bryant Internal. Late.
No. 104 Rivett. 1942.

GRINDERS SURFACE
16"x16"x48" Thompson, Type C. 1943.
14"x36" Pratt & Whitney Vertical. Late.
6"x18" Robot. 1942.
72" Rogers Knife Grinder. Late.
No. 2B Reid. 1944.
No. 25A Heald Rotary. 1942.
No. 22 Heald Rotary. 1943.
6" Taft Pierce Rotary. Late.
A-18 Arter Rotary. 1942.

GRINDERS, TOOL & CUTTER
No. 2 Leblonde. Late.
No. 13 Brown & Sharpe. Univ.
No. 91A Covel Universal. 1942.
No. 22 Covel Universal. 1942.
No. 4T Sellers Carbide Tool. 1942.
Barber-Colman Combination. 1943.
No. 44 & 48 Excello. 1942.
Milwaukee Face Mill. 1942.
No. P5 Bura Way Carbide Tool. 1942.

LATHES, ENGINE
18"x54" Lodge & Shipley. 1943.
18"x48" Bradford. 1942.
14"x30" American "Pacemaker". 1944.
16"x28' South Bend c.d. 1944.
14"x54" Reed Prentice. 1942.
14"x30" Lodge & Shipley. 1943.
14"x6' Hendey.

LATHES, PRODUCTION
20"x25" Fay Automatic. 1942.
Model 10 Sundstrand. 1942.
Model 8 Sundstrand. 1942.
14"x42" Monarch "Magna-Matic". 1941.
12"x18" Lipe "Carbo". Latest.
9"x20" Lipe. 1942.
8"x36" Lo-Swing Semi-Auto. 1942.
8"x21" Fay Automatic. 1942.
Model IMP & R Lo-Swing. 1942.

LATHES, TURRET
No. 9A Jones & Lamson. 1942.
No. 3L Gisholt. Late.
No. 2L Gisholt. 1942.
No. 1A Warner & Swasey. 1944.
No. 1 Acme Universal. 1941.
8½"x24" Acme. 1943.
No. 2A Warner & Swasey.
No. 5 Warner & Swasey. 1941.
No. 4 Warner & Swasey. 1941.
No. 3 Warner & Swasey. 1943.
No. 2 Warner & Swasey. 1941.
No. 2, 5 & 7 Bardons & Oliver. 1941.
No. 3 & 4 Gisholt. 1943.
No. 4 Midland. Late.

MILLING MACHINES, PLAIN
No. 3B Brown & Sharpe. 1941.
No. 2B Brown & Sharpe.
No. 2 Cincinnati Dial Type. 1942.
No. 2M Cincinnati.
No. 2H Milwaukee. Late.
No. 2HL Milwaukee. 1942.
No. 3 Van Norman. 1942.
Van Norman Hand Mill. 1942.

MILLING MACHINES, PRODUCTION
No. BL2420 P & W "Keller", 3 spindle. 1942.
No. BL2416 P & W "Keller", single spindle. 1943.
No. BG "Keller" single spindle.
No. 4-48 Cincinnati Plain. 1942.
No. 1248 Milwaukee "Simplex". 1942.
No. 2-18 Cincinnati, Rise & Fall. 1942.
No. 1-18 Cincinnati. 1942.
No. 08 Cincinnati, Rise & Fall. 1942.
No. 08 Cincinnati Plain. 1942.
No. 12 Brown & Sharpe. 1942.
No. 1-8 Kent Owens. 1942.
No. 1-14 Kent Owens. 1943.
No. 2-20 Kent Owens. 1942.
No. MM-1-5-2 U.S. Multi-Miller. 1943.
No. MM-1-6 U.S. Multi-Miller. 1942.
No. 0 & 2 Sundstrand. 1943.

MILLING MACHINES, THREAD
6"x60" Pratt & Whitney, Late.
12"x54" Lees Bradner. Late.
8"x16" Hanson-Whitney. Late.
4½"x12" Pratt & Whitney. Late.
4"x9" Hanson-Whitney. Late.

MILLING MACHINES, UNIVERSAL
No. 2 SU Van Norman. 1942.
No. 2H Milwaukee. 1942.
No. 2 MH Cincinnati Univ. 1942.

MILLING MACHINES, VERTICAL
No. 2 Milwaukee, Model D. 1945.
No. 3K Milwaukee. 1942.
No. 3H Milwaukee. 1940.
No. 2K Milwaukee. 1942.
No. 3 Cincinnati. 1942.
No. 2 Cincinnati. 1940.
No. 2 Milwaukee.
No. 1 Claveland. 1942.

MISCELLANEOUS
6'x½" Bertsch Bending Roll. Late.
10'x14 Ga. Chicago Press Brake. Late.
No. 333 Chicago Press Brake. Late.
No. 405 Williams Turnings Crusher. 1943.
200 Lb. Bradley Helve Hammer. 1941.
No. 7B High Speed Riveting Hammer. 1942.
J & L Comparator. Late.
50KVA Federal Spot Welder. 1942.
Model MA Sunnen Hone. 1942.
No. 616 Cleveland Rigidturner.
No. 26 F Norton "Hyprolap". 1942.
No. 74 Excello Center Lapping Mach. 1942.
3' Leland Gifford Radial Tapper. 1941.
No. 1 Savage Roller Type Nibbler. New.

PLANERS & SHAPERS
52"x36"x40' Cincinnati Planer.
36"x36"x16' Ohio Planer.
16" Gould & Eberhardt Shaper.
12" New Haven Vertical Slotter. Late.
6" Pratt & Whitney Vertical Shaper.

PRESSES
100 Ton Hannefin Hydraulic. 1942.
50 Ton Denison Hydraulic. Late.
45 Ton Reliance. 1942.
No. 8-6 Zeh & Hannemann. 1942.

SAWS
14"x20" Racine "Shear Cut". 1942.
13"x13" Peerless Universal. 1943.

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Kearney & Trecker 2H Horizontal Mill '43
Cincinnati 1-18 Prod. Mill Backlash Elim. '43
Sundstrand #1 Horizontal Rigidmill '42
Warner & Swasey #5 Bar and Chuck '43
B. & O. #5 Bar Feed '45
Gisholt #3 Bar Feed Pre-Selector Head '43
Gisholt 1L Bar and Chuck 1935
New Britain Model 61 1⅝" 6 Spindle Auto. Screw Machine '42
Greenlee 1⅝" 6 Spindle Auto. Screw Machine '41
Pratt & Whitney 12"x30" Tool Room Lathe TA '44
Springfield 14"x24" Mfg. Lathe '40
Allen 2KH 6 Spindle Drill Press '45
Foot-Burt 2 Spindle Drill Press '45
Canedy-Otto 3 & 4 Spindle Drill Presses
Bliss #305 96 ton Press '42
Cincinnati #2 Centerless Grinder '41
Gisholt 1S Dynetric Balancer '45
Jones & Lamson Model TG-615 Thread Grinder '42

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Bor. Mill. Hor. 3" G and L. MD.
Boring Mills, 24"-36"-42"-52"-72"-96"
Drills, Radial 3'-4'-5'-6' Cin.-Bick.
Lathe, Turret 3-A W and S. S.P.D.
Millers, Plain No. 3 K and T. No. 4 Cin.
Millers, Vertical No. 3 B and S and No. 4 Cin.
Shaper, 18"-20"-24"-36".
Shaper, 36" Morton Draw Cut.
Squaring Shear, Niagara 11'x10 gauge

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BENNETT SPECIALS

36" Bullard Mill, Spiral Dr., 4 Jaw
4" bar Universal Table Type Mill, 60" spin. to table, 96" spin. to outer support, '42.
3" bar Yoder, Table Type Hor. Mill, 30" spin. to tble., 72" spin. to outer support
48"x20' centers N.B.P. Lathe, Grd. Hd.
36"x32" bed Niles Lathe, 2 carr., T.A.
No. 4 Gisholt Univ. Turret Lathe, 1942
2⅜" Acme Gridley RB8, Automatic, 8 spin.
1⅝" Conematic, 8 spin. (4)
36"x36"x12' Cinci. Hypro Planer, 4 hds., Var. Voltage, 1943
42" & 36" King, Side Hd., (2) '43
2½" bar #25T G & L Table, '43
16"/18¼"x54" cc Reed Pr., 1942
3' Fosdick 11" col., late, 1943
#65 New Britain Gridley, 6 spin., '43
#36 Van Norman Miller, 1944
ML18 Duall Saw, late
#174 Heald Gap Int. Grinder
#26Y28 Bryant Int. Grinder
4'13" Coll. Bickford Radial, Late
28 60 Cinci. Hydrotel Mill, 1 spin.
#3 Cinci. Dial Miller, H.S.
#3H K & T Millers (2) Late
#2MH Cinci. Millers (2) Late
#1-18 Cinci. Millers (2) Late
4 Spin. Cinci. 360 deg. Auto Profiler
4" Oster #704 Pipe Threader, M.D.
12"x24" G & L #45 Surface Grinder
#3 and #1A W & S Turret

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AJAX 1½", 3½" Upsetter and Forging MD
BIRDSBORO 325 Ton Vert. Press Hydraulic New 1942
BUL.ARD 16 6-spindle Multaumatic New 1943
BRIDGEFORD 36x24' Centers MD
CINCINNATI #3, 4 Plain Miller M.D
CLE-RING 50 Ton Hyd. Press New 1940
CRANES from 5 to 30 ton cap. 230 volts DC
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AUTOMATIC—2-⅝" N.B. 4 Sp. 1940
BOREMATIC—#47 A. Heald 3 Hds. 1942
DRILLS—Delta 4 Sp. 17" 1946
MILLS—#3 Cin. Mod. Speed Dial 1942: 45-60 Cin. Hyd. 1933: 35-60 Cin. Duplex Hyd. 1933: #1-12 Cin. Automatic 1942: Thread 20 MB Smalley General: Taylor Fenn Spline Duplex 4" Late: #3 K & T Vert. Rot. Table Built in.
TAPPERS: #2-½ Allen #3 MT 15" Throat #3 D.B. Cleveland 1-½" 1944
GRINDERS—Landis 14x72 Ser. 15896: Norton 10x36 Angle 45 Cyl. 1943 Cin. 10x18 Plain Cyl. 1941: Landis 4x12 Mod. 4H 1942: Excello #33 Thread 6x18—1944: Heald 72-A-5 Internal 1941: B & S #2 Univ. 1938: Pratt & Whitney 9" Spur Gear ser. 132: Pratt & Whitney 10" Spur & Helical: Ingersoll Cutter 30" ser. 15121
MAGNA FLUX—Model ANQ 484.5 AC 1943
CHIP WRINGER—40" Tollhurst 1945
DUST COLLECTOR—6D, 10D Roto-clone: M.G. Set 100 KVA 2300 V Syn to 230 V, DC Older

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BORING MILL, Vert. 14' Niles 2 Hds., M.D.
BORING MILL, 36" Bullard, "New Era"
BORING MILL, 72" N-B-P, 2 hds., M.D.
BRAKE, Press, 36 Ft. x ⅝", 60" thrt., M.D.
CHIP CRUSHER, American, No. SZ-15, M.D.
DRILL, Radial 3' & 5' Cincinnati-Bickford.
GEAR HOBBERS, 12-H Gould & Eberhardt.
GRINDER, Broach, "E" Thompson, 6x48" Hyd.
GRINDER, Disc, No. 24-52" Gardner, vert. spdle.
GRINDERS, Surf. Nos. 3 & 5 Abrasives.
GRINDER, Surf. Rotary No. 25 Heald.
GRINDER, Snag., Manchke, wheels 24"x3", M.D.
GRINDER, T & C, No. 3 Ohio
HAMMER, Pneumatic, Nos. 4-B & 6-B Nazel.
LATHE, 14"x6' Headey, Grd. Head, T.A.
LATHE, 14"x8' L & S, 12-Speed Grd. Hd.
LATHE, 22"x10' L & S, G.C.G., T.A.
LATHE, 36"x24' N-B-P, Geared Hd., G.C.G., T.A.
LATHE, 42"x8' c-s, L & S, G.C.G.
LATHE, 24"x12' American, Geared Head
LATHE, 60"-90"x22' American, M.D.
LATHE, Tur., No. 4-A W & S, 8" H.S., M.D.
MILLERS, Pl. No. 4, & 5 Cincinnati.
MILLER, Plain No. 4B K & T, Vert. Att.
PLANER, 22"x36" N-B-P, 4 Hds., M.D.
PLANER, O.S., Hyd., 42"x42"x12' Rockford
PRESS, No. 59½ Toledo, 1200 Ton, 14" Stroke
SAW, Friction, No. 1 Ryerson, M.D.
SHAPERS, 24" and 32", M.D.
SHAPER PLANERS, Openside, 20" Farguhar.

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Cleveland O.S. Planer 36"x8', 2 hds.
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Cincinnati D. H. Planer 36"x36"x10', 2 hds.
Monarch 20" grd. hd., M.D. Lathe 16 sp. Speeds Model "M"
Bullard Vert. Turret Lathes, 24" & 36" S. Head
Defiance 3" Horiz. Boring Mill & Univ. No. 3-A
L & S 18x12' & 20'x10', 20'x8' Grd. Hd., M.D
& 28"x12' Lathes Monarch Model "C"
American 24x12 grd. hd. lathe, m.d. q.c.g.
American 4-ton vert. Hydr. Broach
Blanchard Vert. Surf. Grinder, 26 rd. chuck
Cincinnati No. 2 Centerless Grinder
Colburn 60" & 72" Vert. Boring Mills
Cincinnati 1-M grd. hd., Univ. tool room Miller.
Cincinnati No. 5 H.P. grd. hd, S.P.D. Pl, Miller.
W. & S. No. 2A grd. hd, Univ. Turret Lathe, S.P.D.
Foster No. 2F Ostermatic grd hd. Turret Lathe, M.D.

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McDONALD MACHINERY CO.
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16"x54" LE BLOND Toolroom Lathe, '43
20"x10' AMERICAN High Duty 12 Speed Timken Head, taper attachment, M.D.
24"x16' LODGE & SHIPLEY 12 speed Geared Head Engine Lathe taper attach.
48"x28' DRIGGS (NEW HAVEN) Geared Head Lathe
No. 3 BARDONS & OLIVER Turret Lathe
No. 4 GISHOLT Turret Lathe
No. 4 CINCINNATI Dial Type Plain Mill
No. 1224 KEARNEY & TRECKER Simplex
42"x42"x12' INGERSOLL Adjustable Rail Planer Type Mill, 4 heads, 25 HP motor
32" OHIO Heavy Duty Shaper, 1942
Type BGI-482 KELLER Automatic Toolroom Duplicating Machine, 3 dimensional, 1944
6' CINCINNATI GILBERT Radial, 15" Column, Motor on Arm
8' CARLTON, 17" Column, Motor on Arm
No. 5 NEWARK Universal Gear Hobber 72" cap.
62" KING Vert. Boring Mill, 2 swivel heads, Rapid traverse A.C. Motor

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Cincinnati #3 centerless grinder, 1942
K & T #3H plain milling machine, 1941
Gisholt #1L turret lathe, preselector, 2½" cap, bar and chucking, 1943.

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INDUSTRIAL CHILLING MACHINE
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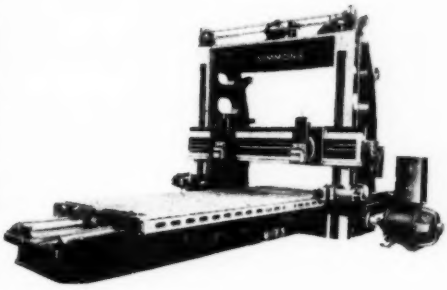

120"x96"x30' Simmons Heavy Duty Planer, 2-side heads, 2-rail heads, forced feed lubrication to ways. Power Rapid Traverse. 230 volt D.C. Planer Type Reversing Motor. New 1943.

PLANERS

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72"x72"x24' Detrick & Harvey Openside, 3-Heads

60"x60"x18' Detrick & Harvey Openside, 3-Heads

60"x60"x16' Cleveland Openside, One Rail, One Side Head

36"x36"x10' Cleveland Openside, One Rail, One Side Head

32"x36"x66" Rockford Hydraulic Openside

16'x12'x35' Niles Variable Voltage Drive, 4 Heads, Power Rapid Traverse, Forced Feed Lubrication, Tool Lifters.

136"x96"x30' Simmons 4-Heads, Power Rapid Traverse

84"x75"x20' Detrick & Harvey Extra Heavy, 3-Heads

72"x72"x18' Niles, 4-Heads, Power Rapid Traverse

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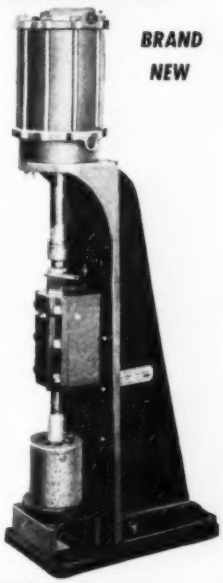

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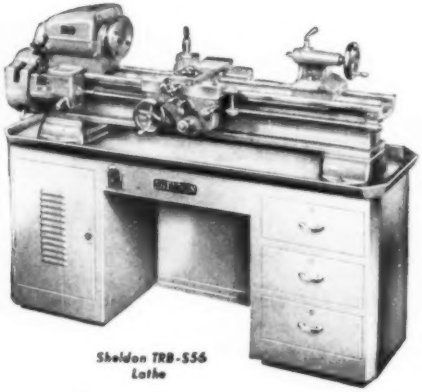
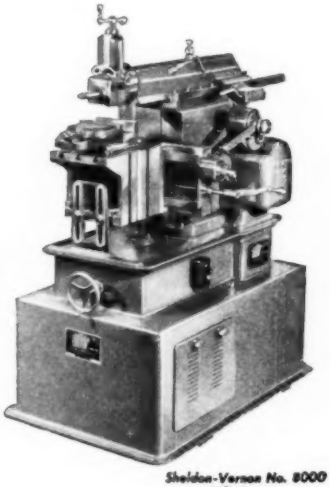


Sheldon TRB-556 Lathe



Sheldon-Vernon No. 8000 12" Shaper

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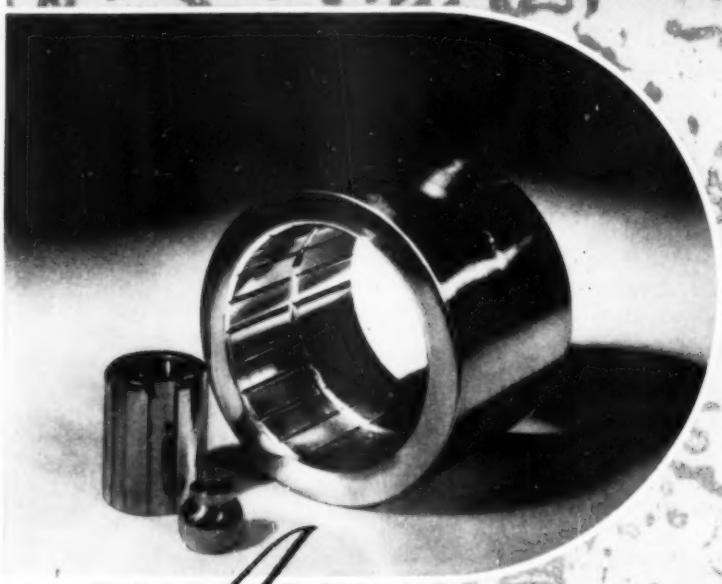

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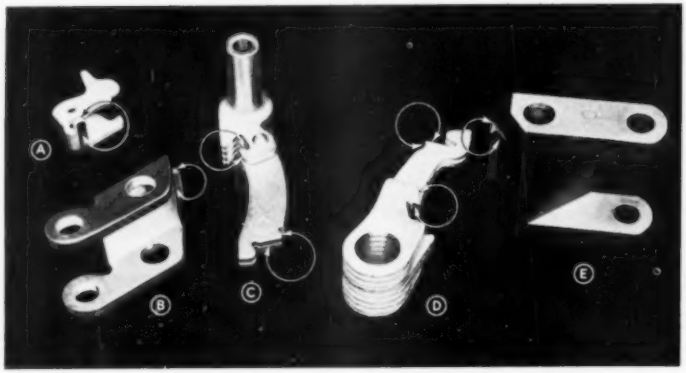
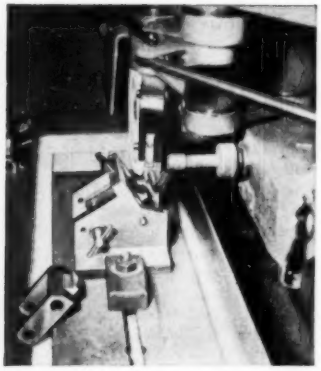
How to take the guesswork out of contour-grinding

Moore Panto-Crush Wheel Dressers Step Up Latch Output 30% for I-T-E, Assure Interchangeability of Parts.





Contour grinding of latch level—Part "E" at left. Here two surfaces and two radii, including inside fillet, are being ground simultaneously.

Five principal I-T-E circuit breaker parts finish ground with Moore Panto-Crush Wheel Dresser. Surface areas between arrows are ground. A comparison of pieces per hour between new method and old method follows:

Part	Moore Panto-Crush	Old Method	Saving
A	22	15	33%
B	32	22	31%
C	31	18	42%
D	14	12.5	10%
E	25	17	32%

I-T-E's experience with Panto-Crush Wheel Dressers was fully reported in "American Machinist." We'll gladly send you a reprint and our catalog.

They've taken the "by-guess-and-by-gosh" out of the contour-grinding of toggle latches at I-T-E Circuit Breaker Company, Philadelphia, switchgear manufacturers. Moore Panto-Crush Wheel Dressers have solved the problem of accurate, interchangeable production of these moving mechanical parts so essential to faultless circuit breaker operation.

Irregular contours are now ground by wheels diamond-dressed to exact dimensions within .0002". Before installing Moores, I-T-E ground the contours by shifting the parts at different angles. Accuracy and field interchangeability suffered. Today both are completely satisfactory, and output itself is up 30%!

The Panto-Crush is mounted on the wheel spindle of a surface grinder. It is the only wheel dresser combining a precision-built pantograph for guiding the diamond from a template and a self-driven crush former. You switch from one to the other without removing workpiece.

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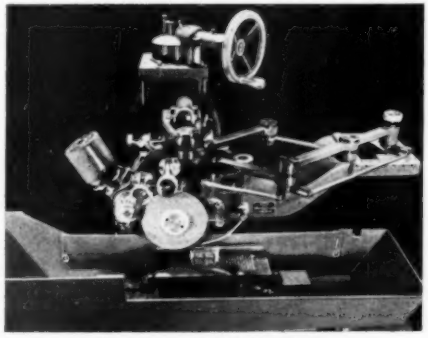

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"PITTSBURGH" *Power Driven* BRUSHES

A "Pittsburgh" power-driven brush in operation at the Steelcrete Division of Wheeling Steel, Beach Bottom, W. Va. This special brush is on the job every day deburring and cleaning large sheets of Expanded Metal.

On the job for...

WHEELING STEEL

Pittsburgh's ingenuity in designing special brushes for unusual jobs is sought time and time again by leading firms in almost every industry. Wheeling Steel, for example, recently put its brushing problem before Pittsburgh's staff of skilled brush engineers.

Selecting a .014 steel wire with pre-tested fast cutting qualities, Pittsburgh engineers designed and built a *Perfect Balance* rotary brush that could take a beating and come right back for more. The brush was *stiff* enough to remove stubborn burrs. It was *tough* enough to penetrate and thoroughly clean the metal. And it was *soft* enough not to impair surface texture.

The brush did the job right from the first day it was put into operation—another example of Pittsburgh's ability to cope with the most difficult brush problems.

There's a "Pittsburgh" Brush for Every Industrial Use!

- GLASS
- STEEL
- PLASTICS
- AUTOMOBILE
- RUBBER
- PAPER
- TIRE and RETREADING
- SHOE MANUFACTURING and REPAIRING

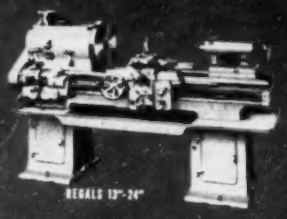
In the complete Pittsburgh line are brushes of all types, including "Perfect Balance" sections, wheels and assemblies. Consult the Pittsburgh engineering representative. He will gladly work with you in developing any type of power-driven brushes to meet your particular finishing specifications.

Phone or write Pittsburgh Plate Glass Company, Brush Division, 3221 Frederick Ave., Baltimore—29, Maryland

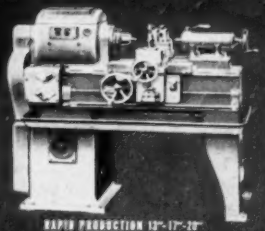
Power Driven BRUSHES

BRUSHES · PAINT · GLASS · CHEMICALS · PLASTICS

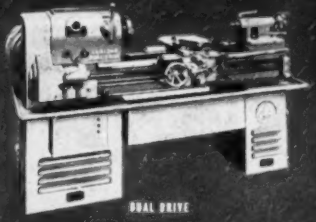
PITTSBURGH PLATE GLASS COMPANY



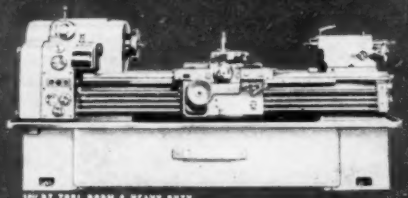
REGALS 13"-24"



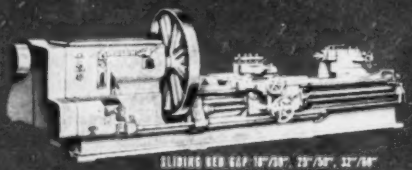
RAPID PRODUCTION 13"-17"-20"



DUAL DRIVE

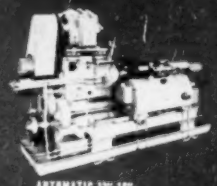


10" BT TOOL ROOM & HEAVY DUTY

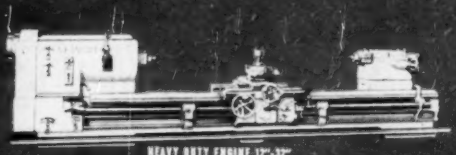


SLIDING BED GAP 16"/30", 25"/50", 32"/50"

More Lathes mean Greater Choice, Better Buy!



AUTOMATIC 12"-16"

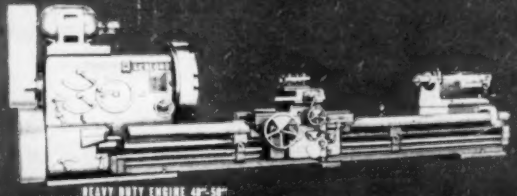


HEAVY DUTY ENGINE 12"-32"

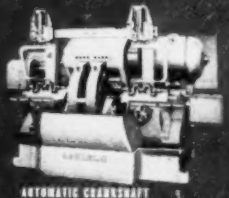
No. 2 CUTTER GRINDER

UNIVERSAL CRANKSHAFT 20"-30"

HOLLOW SPINDLE 10"-30"



HEAVY DUTY ENGINE 40"-50"



AUTOMATIC CRANKSHAFT

THE R. K. LeBLOND MACHINE TOOL CO., CINCINNATI 8, OHIO

LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES

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LeBLOND

Two ways TIMKEN® tube engineering service cuts costs on hollow parts

1. Saves metal
2. Saves machining time

USING mechanical tubing to make hollow cylindrical parts usually means an important saving in both material costs and machining time. Yet the experience of the Timken® tube engineering service shows that many manufacturers are saving far less than they should!

That's because they are not using the most economical tubing for the job.

The Timken tube engineering service gives you a guaranteed way of getting maximum metal savings and minimum scrap loss. You simply give us the specifications for your finished part. We take all the responsibility of recommending the most economical tubing for the job. Possibly it will be a lighter tubing—a different grade—or surface finish—than you are using now. Yet we guarantee that you will have enough metal to fill out to your dimensions!

Using the right tubing for your job also means maximum saving in machining time. Your operators can produce more pieces per shift.

The success of the Timken tube engineering service is due to years of experience in serving mechanical tube users in practically every large scale industry. One of our engineering departments devotes its full time to this job. Rigid control of Timken tubing through every stage of manufacture results in outstanding uniformity, and the largest assortment of roll sizes of any mechanical tubing mill in the country enables us to supply tubing that means maximum economy in handling practically any job.

If you manufacture hollow cylindrical parts, a letter including the following information will bring you this service at no cost or obligation. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

All you have to do is give us this information:

1 **FINISH MACHINED DIMENSIONS**, i.e.—The maximum machined O. D. x minimum machined I. D. x length. Dimensions should include applicable tolerances. If only finish ground dimensions are applicable or available this should be noted. Furnish a blueprint if possible.

2 **MACHINING**—Is part held on O.D. or I.D. during the initial machining operation? Give complete sequence of operations when practical.

3 **FINISH OF TUBING DESIRED**—Hot rolled, Cold Drawn, Rough Turned, Roto-rolled or Centerless Ground.

4 **CHEMICAL ANALYSIS AND OTHER SPECIFICATIONS.**

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

Specialists in alloy steel—including hot rolled and cold finished alloy steel bars—a complete range of stainless, graphitic and standard tool analyses—and alloy and stainless seamless steel tubing.